IN THIS ISSUE—DETAIL OF MERCEDES AIRPLANE ENGINE

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The AUTOMOBILE and Automotive Industries

VOL. XXXVII NEW YORK—THURSDAY, SEPTEMBER 6, 1917—CHICAGO NO. 10

War's Benefit to Automotive Industry

Co-operation, the Keynote of Progress, Now Highly Developed in Automotive Work, Will Have Far-Reaching After-War Effects

By A. Ludlow Clayden

CIVILIZATION as compared with savagery is co-operation as compared with individualism. There is hardly a savage living an entirely individualistic life; there is hardly a civilized man living an entirely co-operative one.

This war has developed co-operation more rapidly than two centuries of peace would have done —co-operation in every walk of life, between one man and another, between one business and another, between one nation and another. The amazing achievements of each of the nations engaged have been the results of co-operation and they have been amazing just because the world never before realized what co-operation on a large scale could do. Now we have seen what it can do in war, but it remains to be seen what peace will bring forth.

Co-operation to Continue

One thing is clear so far as industry is concerned, and this is that co-operation in business is going to continue at least within each nation. To rebuild the industries of France, of England and of Germany; to restore them to their former state in reasonable time will not be possible without co-operation; still more will it be needed to raise industries to a higher peak than before the war and they must be so raised if the world's debts are to be paid.

The automotive industries of all nations are in a particularly happy position for peace-time rejuvenation and expansion. First, there is the certainty of a continued demand for automobiles of all classes, since the world is far from fully supplied. Second, the truck field is enormously increased by shortage of horses, which will persist for years, and still more by the imperative necessity for speeding up business. Third, the tractor industry is only just being born, and fourth, the airplane is in an even more nascent state.

Work Brings Prosperity

An industry consists of its personnel, its plants and its buildings, but most of all its personnel. If there is work for everyone trained in a particular industry then that industry is prosperous; if there is not enough work to keep all the factories fully employed then the industry is in trouble.

Now the world has so many thousands of men trained for automotive work. If we add the other thousands originally automotive men and now in military service we have the total of men whose natural work lies in automotive channels. If we can keep all those men adequately employed the automotive industry will boom after the peace.

It ought to be an easy task. In automobiles the science of economical production is only partially developed. The lessons learned in automobile shops have got to be applied to tractor and airplane build-

ing. We shall have to have inexpensive machines in all fields of automotivity.

In engineering the problems ahead were never so great. The tractor and the airplane, rapid though their development has been, are only in early stages. Then there is the whole great question of fuel, for we are in sight of the end of easily procured light oil. Beyond this even, there is the fact that all automotive machines are very inefficient from a thermal viewpoint, and as trucks, tractors and airplanes come into commercial service more and more, the importance of economy in operating cost increases steadily.

Food Is Most Important

The most important thing to the world is its food. Cheap food is only obtainable throughout the world by the assistance of cheap transportation. Thus the need for transportation goes hand in hand with the need for food. The tractor and the truck, one at the beginning and the other at the end of the chain, are essentials in the production and distribution of food; thus their efficiency is vital to the cost of food. This means that the automotive industry will be a vital factor in lowering the cost of food from its present high level, and still more vital, perhaps, in preventing future increases.

These facts are being realized; the immensity of the production and the engineering problems are being realized, and the automotive industry of America is co-operating for the purpose of facing the facts. In other countries, notably in France, co-operation of a similar sort is beginning; it is not entirely absent even in England. Never before have whole nations striven knowingly toward one end, co-operated with the knowledge that they *were* co-operating. Never before have rival firms consolidated their brains for the purpose of getting more rapid action on a problem common to all.

These things cannot happen without having an effect *after* the war. We are getting the co-operative habit. In the future we shall never see again the petty rivalries of the past hold up progress of a whole industry. Men who have got together for purposes of war will come together again for purposes of peace when faced with big difficulties. Co-operation does not mean absence of competition. It merely means that an industry with a common competitor unites to overcome him. We are uniting now to overcome the great competitor "cost of living." The automotive industry is beginning to organize co-operatively to fight "shortage of light fuel." It will co-operate in the future to fight "thermal inefficiency" and a host of similar competitors. Competition within the industry remains unchanged, the effect of co-operation is merely to benefit an industry as a whole.

It is hard to realize many of the great changes going on at present. The visionary scheme of yesterday becomes the fact of to-day and the platitude of to-morrow. The speed of events is faster than the human mind's power to grasp. Changes of the largest sort appear with the speed of a projectile, and one notices the effect afterward rather than the change itself.

War's Effects Enduring

All industries will be affected forever by the war; the automotive industry perhaps more than any other, and the great firms and great men of the automotive world after peace comes back again will be those with the greatest power to appreciate what is happening now and the future effect of those happenings. Foresight was never at such a premium, tardiness never at such a discount. The future is dark and we must make full use of each fitful ray of light that seems to pierce it.

Class B Army Truck Drawings Nearly Completed

WASHINGTON, Sept. 5—*Special Telegram*—The drawings for the standard military class B truck are nearly completed. At present it is the final details that are being settled, and castings, etc., are already in the shops for the first chassis. All the principal detail drawings will be in final form by Saturday night.

For the engine a 6-in. stroke has been chosen. For the class B the bore will be 4¾ in. and for the class A 4⅛. Practically all the other details of the two engines are identical, crankcase, crankshaft, camshaft, motor accessories, etc. The crankcase is aluminum and the cylinders are cast in pairs with detachable heads. The manifolds are arranged so that the major portion of the intake is exhaust warmed from the exhaust manifold immediately above it. Lubrication is fully pressure, much after the style of the Wisconsin engine. There is nothing unconventional about the design, it is simply an example of the very best modern practice.

After much discussion it has been finally decided to house the clutch in a dry disk with multiple plates in the flywheel and not as unit with the transmission, this being settled partly by consultation with French and British representatives and partly by Mexican border experience.

For axles both worm and internal gear are being made and a double reduction model also, but lack of facilities for making the latter makes its final adoption most unlikely. The worm gear men managed to get a 9¾-in. clearance under the axle, which is considered satisfactory. Both the brakes are internal and side by side in the worm axle. They are the endless band type with toggle expansion.

A rather interesting fuel system is adopted. On the steel dashboard is a tank holding 15 gal. and feeding the carbureter by gravity. Under the driver's seat there is another 15-gal. tank which is fitted with a draw-off cock. The idea is that this second supply is to be reserved only, and the driver will transfer to the dash tank in emergency. Gravity feed of this sort requires the very minimum of pipe, and if the tank gives any trouble it is in the easiest position to change it or to make repairs. It is not a pretty job, but it is practical.

For the spring brackets and shackles the type design for the Fageol truck, illustrated in THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES for Jan. 18, 1917, has been employed in this. There is an oil reservoir for each spring attachment and wick feed to the points of contact. By this method there is no flow of oil except when motion occurs.

The system of attachment originated by De Dion-Bouton many years ago is applied at many points. This consists of a pad of soft material such as cork where one part such as a radiator rests on another. Instead of bolting down tight the bolt is extra long and a coil spring is placed beneath the nut. This allows any amount of weave without stressing either part. Rigidity has been avoided everywhere, and the truck should be one of the most limber vehicles ever produced.

The 260-Hp. Mercedes Engine

Part I

A Detailed Technical Description of the Latest Type of German Aircraft Engine Furnished by the British War Office and Based on Data Obtained from a Captured Gotha Warplane

Fig. 2—One of the cylinders complete

IN the last issue to hand of the *Automobile Engineer* there appears a detailed and fully illustrated description of the Mercedes 260-hp. aircraft engine as fitted to the latest German battleplanes. In general constructional detail this latest engine closely resembles the 160-hp. Mercedes and it follows the usual German practice for aircraft engines of this type.

The complete engine, including the propeller hub, measures 6 ft. 5½ in. over all, and from the bottom of the sump to the top of the overhead camshaft casing, approximately 3 ft. 10 in. The bore of the cylinders is 160 mm. and the stroke 180 mm. Four valves are arranged in the head of each cylinder, and these are operated by an overhead camshaft running in a separate housing, supported on brackets screwed into the cylinder heads. The valves are interchangeable. The half compression device is operated by sliding the camshaft in the usual manner, the actuating gear being fitted to the rear end of the shaft casing.

The induction pipe takes its air supply through the base chamber, to the rear end of which it is attached, and a 4 in. diameter passage is cast in the base for this purpose. A simple type of two-jet carbureter is employed.

The main bearing caps are cast integral with the bottom half of the crank case, and the long bolts that secure them pass through the top half of the crank case, and are used for securing the cylinders by means of triangular clamps.

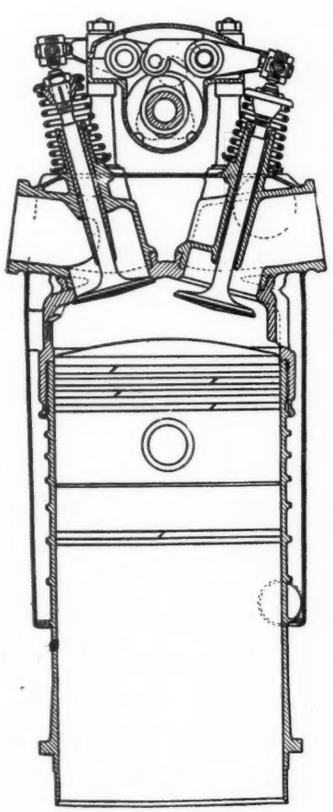


Fig. 1—Section through one of the cylinders

Forced lubrication is, of course, employed. A four-throw eccentric-driven plunger pump is fitted. An "auxiliary" sump in the front end of the crank case is embodied, and small supplementary pump plungers, which work in conjunction with the main oil pump, feed fresh oil into the system from the service oil tank.

Two Bosch Z.H.6 magnetos are fitted, and these are driven off the vertical camshaft driving spindle. The spark plugs are fitted, of course, on the induction side of the cylinders.

The water pump driving spindle is lubricated while in flight by means of a ratchet-driven grease gun or pump, worked by a cable and lever from the pilot's seat. An electrical tachometer is driven at engine speed from the rear end of the camshaft through a flexible shaft.

At the opposite end of the engine to the half compression actuating gear a small direct-driven plunger pump is fitted for providing air pressure to the fuel tank, while just beneath, and attached to one of the pipes, a trap is fixed to prevent oil, which returns to the sump via the oil pump casing, getting into the air pressure supply. A spindle beneath, and on the same center line as the vertical camshaft driving spindle, drives the water pump, which is arranged with a plain dog coupling, so that it may be easily withdrawn should this become necessary.

A feature in the construction of these engines is the general use of soft mild steel for such parts as the lubrication pipes, etc. This practice is not dictated by a shortage of copper, but has been standard with the Mercedes Co. since long before the war.

Such is the general layout of the engine; the following are the more intimate details.

Cylinders

The general construction of the built-up cylinders, composed entirely of steel machined all over, and sheet steel pressed to the formation of the water jackets, presents an interesting example of expert acetylene welding. The building-up methods applied to the cylinders and their general construction are clearly shown in Fig. 1. The cylinder barrels are screwed into the cylinder head, the pitch of the thread being 1.75 mm. (14½ threads per inch.) They are machined from forgings or billets, and the cylinder walls taper in section from 3.5 mm. at the top to 6 mm. at the holding-down or base flange. Six stiffening ribs are arranged, the distance between the ribs increasing toward the base of the cylinder. The barrels extend 35 mm. below the base flanges, and are of 3 mm. thickness for the depth of 12 mm. forming the register, the extension being then reduced to 2.75 mm., presumably as register clearance and to reduce the amount of limit machining.

Steel forgings are employed for the cylinder heads, and into these are built the four valve pockets and also the inlet and exhaust ports. The seatings for the valves are machined in the cylinder heads, and the thickness of the crown of the heads is 11 mm. The valve pockets are also machined from steel forgings, and are acetylene-welded into the cylinder heads. Steel valve stem guides are welded into the valve pockets, and phosphor bronze bushes are pressed into the guides. It will be noticed that the exhaust valve guide is arranged with greater water space than the inlet.

The water jackets are built up in four sections from sheet steel pressings 1.25 mm. in thickness, the lower section of the jacket being of barrel formation and welded to the flange

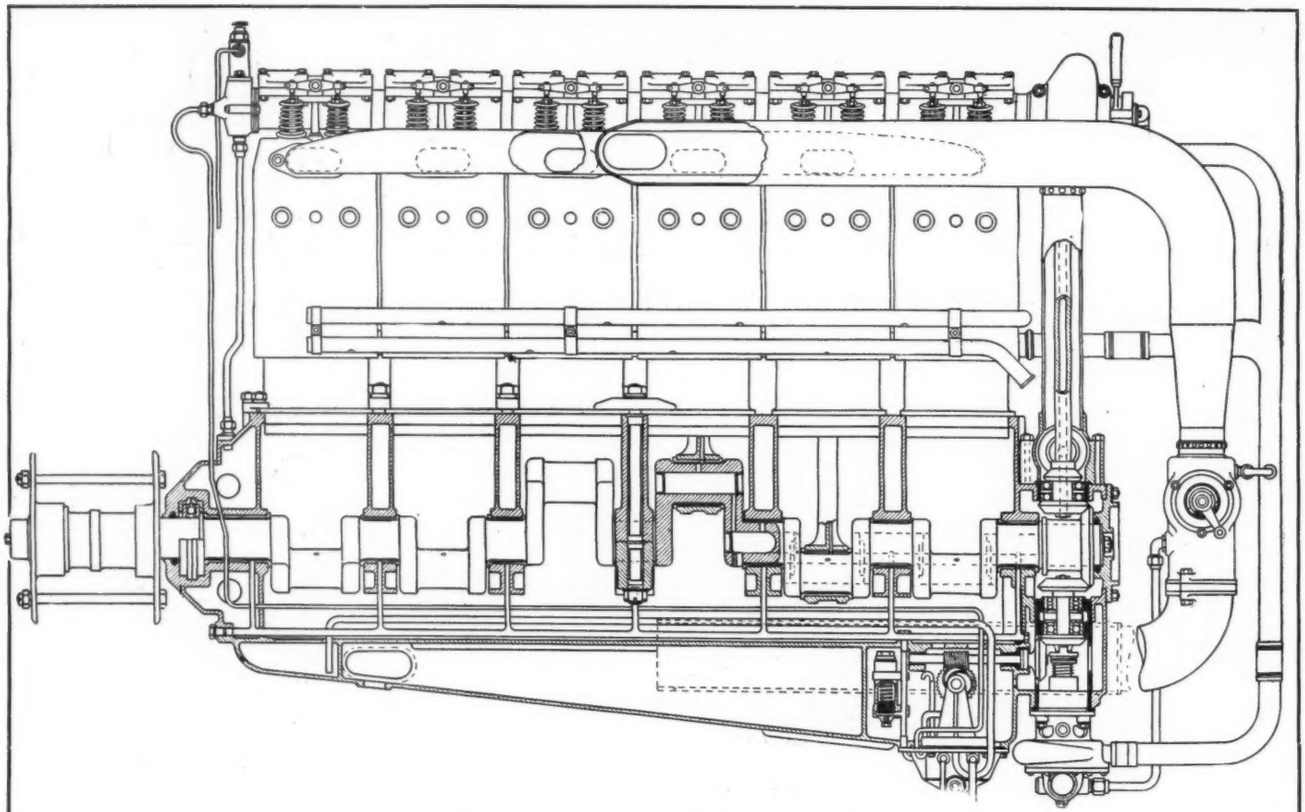


Fig. 3—General arrangement of 260-hp. Mercedes engine

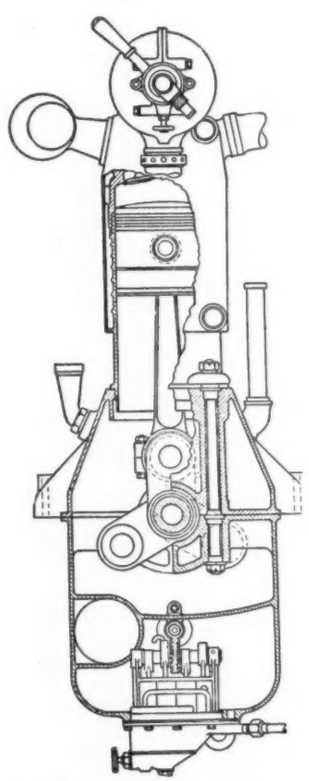


Fig. 4—Cross section through cylinder and crankcase

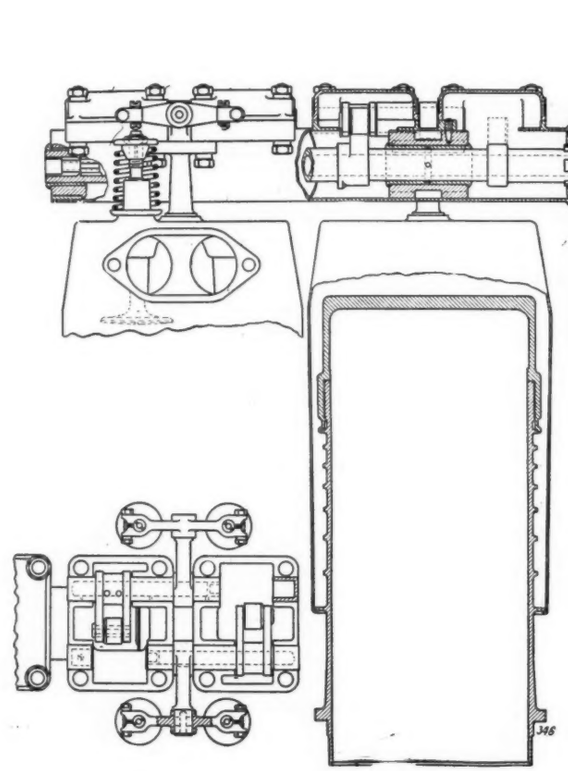


Fig. 5—Arrangement of camshaft and half compression gear

Fig. 6—Camshaft driving pinion

joint on the cylinder walls. The top sections are in halves and encircle the valve pockets, the joints being welded vertically on the center line of the valve ports. A sheet steel disk is welded on to the flanged top sections to form the top of the jacket, and the water circulation pipe connections are welded into the top and bottom of the jackets on the exhaust side. The spark plug bosses are fitted and welded into the cylinder barrels on the induction side just below the inlet valves.

As in the 160 hp. Mercedes engines, the exhaust valve guides are water-cooled by recesses formed in each of the exhaust valve pockets, so that the water is led right up to the valve stem guides. Considering the size of the cylinders, they are remarkably light in weight. The complete cylinder, with valves and valve springs, etc., and including the two brackets screwed into the cylinder head to carry the camshaft, weighs 34.25 lb.

Pistons

The pistons are constructed in two parts—the head which carries the piston pin and the skirt of the piston into which the head is screwed. A steel forging machined all over forms the head, the thickness of the crown being 8.5 mm.; it is slightly domed, as shown in Fig. 7. The skirt of the piston is screwed on to the head and acetylene welded at the joint, cast iron being used for this portion. Three compression rings are fitted in grooves in the cast iron skirt above the gudgeon pin, while a scraper ring is fitted at the base of the piston. The width of the rings is 5 mm., and all the rings are split with a simple diagonal gap cup at 45 deg.; no locating pegs are fitted to maintain their positions. The gudgeon pin, which is 37 mm. diameter, projects through the bosses in the piston head and fits into the piston skirt flush with the outside diameter. It is fixed by an 8 mm. setscrew, passing into the end of the piston pin and through the boss, being locked by a split pin on the inside. The weight of the complete piston with pin and bush is 11 lb.

Valves and Valve Gear

As previously mentioned, the twin inlet and exhaust valves are interchangeable, the maximum diameter of the head of all valves being 60 mm., while the port diameter is 55.25 mm. The lift of both the inlet and exhaust valves is 10 mm., and the clearance between the end of valve stem and adjustment screw of the rocker arm is .018 in. The general arrangement of the valves and rocker arms is clearly shown in Fig. 5.

The valves are operated by a single overhead camshaft, inclosed in a housing machined all over. It is supported on T brackets on the cylinder head, two to each cylinder. The camshaft runs on seven phosphor bronze plain bearings, which are mounted in aluminum bushes fitted into the camshaft housing and located by a tapered grub-screw.

The method of operating the twin valves off one cam and the general design of the camshaft and camshaft housing are interesting; details of this arrangement are also shown in Fig. 5. The spindle of each rocking lever is mounted on three bearings in the camshaft housing, and is so designed that the cam operates the arm of the rocking lever inside the camshaft housing, while the other arm of the rocker operates the valve outside the casing, this arm working between two outer bearings of the rocker spindle situated between the separated compartments of the camshaft casing. On the end of the outer rocker arm a double branch tappet arm is fixed which operates the twin valves. Although these branch arms should not move upon the valve rocker, they are not secured by a setscrew or taper pin; being merely pressed on to the ends of the rocker arm, they are easily driven off, and probably are so arranged in order that they may automatically equalize any variation in valve stem length that develops in work. The spindles of the valve rockers are carried directly in the camshaft housing, no gun-metal or other bushes being fitted. The inner arms of the rocker levers in contact with the cams are fitted with hardened steel rollers.

The diameter of the valve stems is 11 mm., and each valve works in a phosphor bronze bush in the valve stem guide, as already mentioned. All valves are set at an angle of 15 deg. to the cylinder center line, and single helical valve springs are fitted. They measure 39 mm. at the base of the coil and taper to 31 mm. at the top. Conical split nuts, locked by the pressure of the valve spring on its washer, locate the springs on the valve stems.

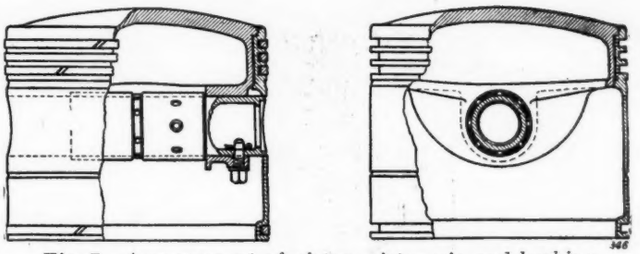


Fig. 7—Arrangement of piston, piston pin and bushing

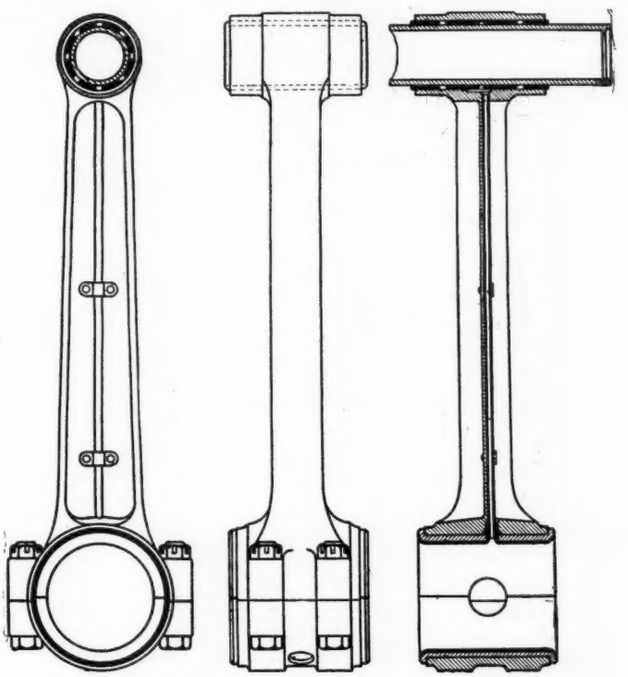


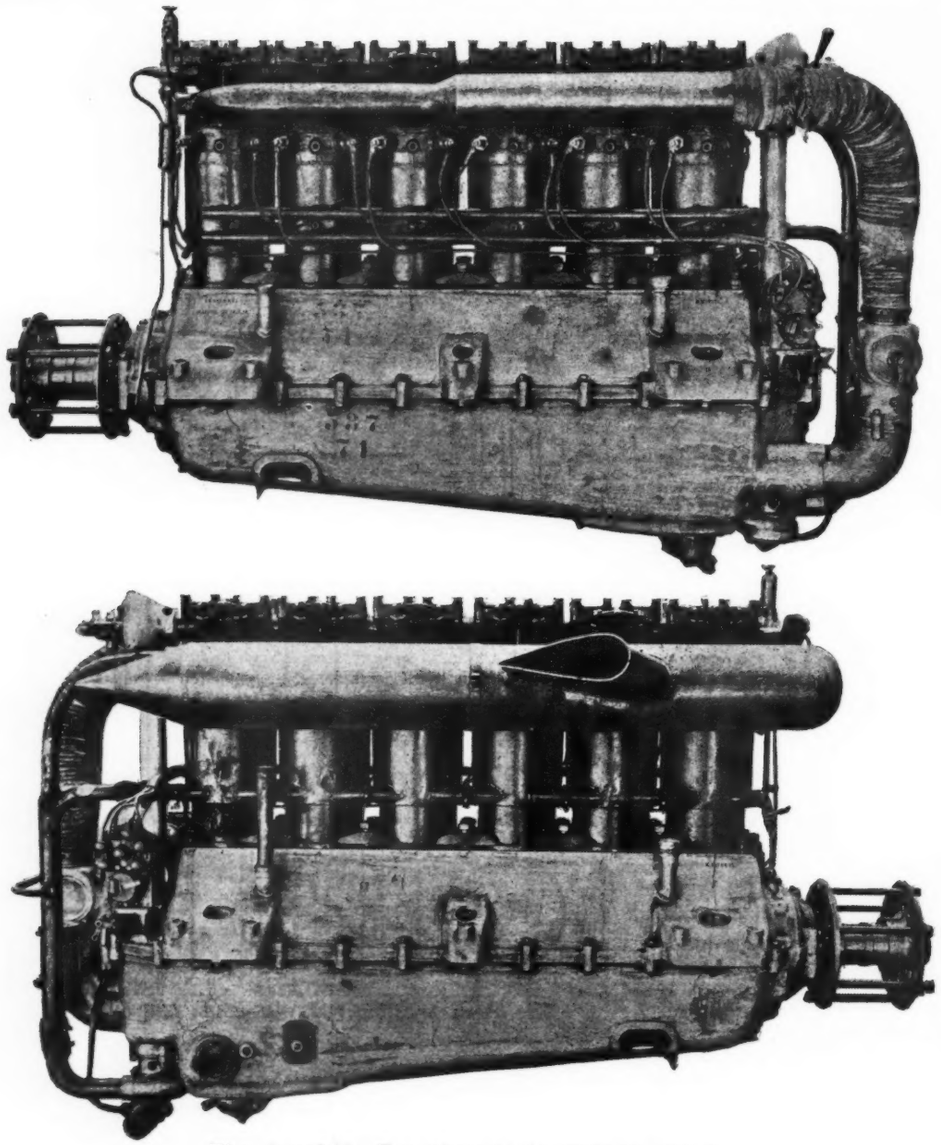
Fig. 8—Connecting rod, piston pin and bushings

Camshaft Drive and Half Compression Gear

The camshaft is driven through a vertical shaft by the main distribution bevel pinion mounted on the end of the crankshaft by four splines. The method of attaching the bevel pinion to the top end of the vertical driving spindle is interesting. The fixing of this pinion is so designed that it may be adjusted for mesh in relation to the teeth of the camshaft-driven bevel wheel. Details of this gear and its fixing arrangement are shown in Fig. 6. The end of the shaft is 23 mm. in diameter and ground parallel; it is fitted with a key, and on this the bevel pinion is a push fit. A ground extension sleeve, tapered and screwed as shown in Fig. 6, is arranged on the bottom of the pinion, this sleeve being split by four sawcuts, so that the application of the threaded collar closes in the slots and so locks the bevel on the shaft.

Half Compression Gear

Sliding movement of the camshaft in its bearings is provided by arranging the camshaft driving bevel wheel upon castellations on the end of the camshaft. The camshaft driving wheel is mounted in a split gun-metal bearing in the rear end of the camshaft housing, and the sliding movement of the camshaft is effected by means of a hand lever set at right angles to the axis of the camshaft, and to which is attached a gun-metal collar threaded inside with a five start square thread of 23 mm. pitch. This collar, which is located in an aluminum housing, engages with a corresponding screw thread cut on the outer diameter of a steel sleeve. Inside the sleeve is a double ball thrust, which is fixed to the rear end of



Figs. 9 and 10—Two views of the complete engine

the camshaft, so that in operation the movement of the half compression lever about the axis of the camshaft rotates the quick thread screw in the sleeve, thus pulling or pushing the end of the camshaft in its bearings through the castellations of the camshaft driving bevel wheel. When the camshaft is drawn to its limit of movement toward the rear, the half compression cam is drawn into line with the roller end of the exhaust valve rocker arm, giving the requisite lift to the exhaust valves. The half compression cam opens the exhaust valve near the end of the compression stroke.

The hardened steel rollers on the cam rocker arms are chamfered off at 45 deg. on one side to allow of easy engagement of the half compression cam, which is also chamfered at 45 deg. The gear is clearly illustrated in the drawing of the rear end of the camshaft driving gear.

Connecting-Rods

These are of normal design and consist of H-section forgings. They measure 326 mm. between centers, and the total weight of the complete connecting-rod, including the small end bush, is 7 lb. The weight of the big end complete is 4 lb. 14 oz., and the weight of the small end 2 lb. 2 oz. The thickness of the center web of the H-section is 2.5 mm., while that of the two flanges is 3.5 mm. The diameter of the big end bearings is 64 mm. and the length 80 mm. These are split in the usual manner and held by four 12 mm. bolts.

The distinctive feature of the connecting-rods is the floating piston pin bush. It is of hardened steel, ground 2.5 mm. in thickness, the outside diameter being 42 mm. and the inner diameter is 37 mm. The bush is a running fit in the small end and also on the gudgeon pin, and is pierced by fourteen 5 mm. holes in the same manner as that adopted upon the floating sleeves of commercial vehicle road wheels. Oil is supplied by a 6 mm. pipe leading upward from the big end bearing. The pipe is of soft mild steel, and attached to the web of the connecting-rod by two riveted clips. Details of the connecting-rods and floating bush are shown in Fig. 8.

Crankshaft

The six-throw crankshaft, which is of very massive design, weighs 139.5 lb., including the propeller hub. The cranks are set at 120 deg., and the diameter of both the crank pins and journals is 64 mm. The length of the front journal bearing next to the propeller is 104 mm., and the length of all the other crankshaft bearings is 64 mm. The thickness and the width of the crank webs increases toward the front end of the crankshaft, so that the thickness of the front web is 29 mm., that of the second 28 mm., while the remainder are all 27 mm. in thickness.

The crankshaft is hollow, and the webs are drilled for the passage of oil from the journals to the crank pins for lubricating the big end bearings in the usual manner. The holes bored in the journals and crank pins for lightening purposes are of decreasing diameters, as follows:

Internal Diameter of Hollow Crankshaft Journals

	1.	2.	3.	4.	5.	6.
Prop end...						
Oil pump..	35 mm.	35 mm.	35 mm.	38 mm.	40 mm.	41 mm.

Internal Diameter of Hollow Crank Pins

	1.	2.	3.	4.	5.	6.
Prop end...						
Oil pump..	32 mm.	33 mm.	35 mm.	38 mm.	41 mm.	43 mm.

The ends of the hollow journals and crank pins are plugged with sheet steel caps, which are driven into the cranks and then expanded into an annular groove cut on the inside.

To take the propeller thrust a ball thrust washer of 110 mm. diameter is provided on the front end of the front journal bearing. It is mounted in a split cage, which is held in the housing of the crank case halves. The propeller boss is mounted on a taper on the crankshaft, and a single key, 120 mm. long and 13 mm. wide, is sunk in the crankshaft.

The front flange and the boss are arranged with six shallow castellations, each 29 mm. wide, and the propeller is clamped by six 18 mm. bolts on a 230 mm. diameter pitch circle. The propeller boss and the front flange are both locked on the shaft by the usual Mercedes locking device.

(To be continued)

1916 Begins Era of Road Expansion

25,897.42 Miles of New Highways Built in Year—Federal Grant of $75,000,000—California and New Jersey Plan Great Systems—Iowa the Leader in Improved Thoroughfares

Distribution of total road mileage at the end of 1916 in the thirty-one States and the District of Columbia, where records are available

ROAD building in the United States entered upon a new era of expansion in 1916. Thirty-three States which keep complete or partial statistics have reported that 25,897 miles of new roads have been built during the past year. This is more than double the number of miles constructed in the same States in 1915, when the figure was 11,352. During 1916 a total of 28,713 miles of road were improved, which was nearly triple the mileage of road improvement in 1915.

This increase in building, however, is but a forerunner of the vast expansion which is to take place during the next 5 years. The Federal Government in July, 1916, appropriated $75,000,000 for highways to be expended by July, 1921. Each State, in order to share in these funds, must appropriate at least an equal sum, which means that $150,000,000 will be spent for roadways in the next 5 years. California has issued highway bonds for $15,000,000; the taxes available for roads in Illinois, aside from any bond issues, will amount to $7,643,515.36 in 1917, and New Jersey has a mammoth road project for the future which will call for the expenditure of $15,000,000.

War Taxes May Delay Movement

The depleting of State and national revenues may delay some of the road projects for immediate future. New Jersey, which had appointed General Goethals as chief engineer to reorganize the State highways, will have to postpone a large part of the proposed improvements for the present. Although the Federal Government has already voted the $75,000,000 for roads, there may be a number of States which

U. S. Roads in 1916

Total Mileage	1,439,297.69
Improved Mileage	324,798.65
New Roads—Miles	25,897.42
Macadam Roads	22,179.73
Expended for Roads	$92,165,139.25
Appropriated for 1917	51,901,449.36

The foregoing figures represent the totals of thirty-four States only, including the District of Columbia.

Road Mileage and Appropriation Statistics in Various States for 1916

State	Total Miles of Roads in State	Total Miles Improved Roads	Miles of New Roads Built in 1916	Miles of Improved Roads Built in 1916	Miles of Macadam Roads in State	Miles of Bituminous Macadam	Miles of Dirt Roads in State	Miles of Brick Roads in State	Miles of Gravel Roads in State	Miles of Other Roads in State	Amount Expended for Roads in 1916	Amount Appropriated for Roads in 1917
Arizona	10,500.00	270.00	.....	55.00	.....	.....	.....	.....	.....	.....	$450,000.00	$900,000.00
Arkansas	51,904.00	27,829.00	9,592.00	.....	364.00	.....	25,158.00	.....	2,209.00	.....	.....	.....
Colorado	40,067.00	8,000.00	.....	1,700.00	.....	.....	39,059.00	.....	.....	.....	2,313,207.43	750,000.00
Connecticut	a12,000.00	a1,425.77	75.00	.....	.....	.....	.....	.....	800.00	200.00	1,753,805.44	.....
California	.....	.....	256.06	.....	.....	.....	.....	.....	.....	.....	.....	*15,000,000.00
Dist. of Col.	513.69	513.69	4.88	.....	.....	.....	.....	.....	.....	.....	1,201,360.00	.....
FloridaF	3,630.00	2,173.00	180.00	463.00	640.00	.....	1,770.00	45.00	.....	335.00	1,352,573.00	666,034.00
Georgia	40,000.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Idaho	24,396.00	5,079.00	.....	.....	43.00	.....	23,717.00	.....	168.00	468.00	1,300,000.00	1,000,000.00
Illinois	95,803.00	17,535.65	.....	a150.00	.....	.....	.....	.....	.....	.....	a8,000,000.00	7,643,515.36
Iowa	111,415.00	111,415.00	.....	.....	.....	.....	111,138.00	.....	277.00	.....	s3,276,126.00	.....
KentuckyK	6,598.00	1,335.00	388.00	228.00	818.00	.....	5,199.00	.....	80.00	.....	827,275.00	493,000.00
Maine	25,530.00	1,354.16	242.00	242.00	49.89	46.33	24,175.8	.....	1,100.34	158.10	1,445,794.38	1,480,000.00
Maryland	15,582.00	1,057.38	.....	111.18	686.36	.....	.....	1.62	139.12	230.28	1,225,000.00	.....
Massachusetts	23,357.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	12,032,670.00	.....
Michigan	70,000.00	4,289.00	.....	1,093.00	928.00	.....	.....	.....	2,750.00	611.00	11,644,596.00	.....
Minnesota	93,000.00	.....	633.90	3,366.10	.....	.....	.....	.....	12,700.00	.....	7,500,000.00	.....
Missouri	98,581.00	42,581.00	.....	.....	1,559.00	.....	93,155.00	1.00	3,442.00	425.00	4,051,956.00	400,000.00
Nebraska	80,338.00	850.00	.....	.....	200.00	.....	.....	.....	500.00	4.00	2,500,000.00	2,600,000.00
New Hampshire	15,116.00	1,254.05	.....	103.86	187.68	.....	.....	.....	970.81	7.29	870,000.00	a350,000.00
New Jersey	20,445.00	15,000.00	65.3	65.3	a3,200.00	472.00	a6,125.00	143.00	a3,600.00	.....	ac1,719,500.00	2,300,000.00
New Mexico	.....	.....	314.54	.....	.....	.....	.....	.....	.....	.....	850,000.00	400,000.00
New York	80,000.00	16,974.00	.....	514.00	10,000.00	.....	73,526.00	270.00	6,700.00	615.00	5,625,768.00	.....
North Carolina	57,000.00	.....	.....	10,400.00	.....	.....	.....	.....	.....	.....	.....	.....
North Dakota	74,822.00	28,877.00	6,822.00	2,627.00	.....	.....	73,763.00	.....	1,059.00	.....	2,711,295.00	83,000.00
Oklahoma	140,000.00	6,000.00	6,000.00	6,000.00	7.0	.....	100,000.00	.....	10.0	2.0	2,300,000.00	.....
Pennsylvania	97,850.00	s10,235.00	223.74	223.74	s1,630.8	s164.2	s5,661.00	s45.9	s215.2	.....	3,000,000.00	.....
Rhode Island	2,200.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	470,000.00	.....
Utah	3,428.00	2,368.00	.....	.....	35.00	.....	2,775.00	.....	530.00	100.00	905,160.00	2,000,000.00
Vermont	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Virginia	52,000.00	4,462.00	.....	.....	.....	.....	.....	.....	.....	.....	1,598,639.00	407,200.00
Washington	43,000.00	5,800.00	1,100.00	.....	700.00	.....	38,122.00	.....	280.00	4,300.00	7,500,000.00	3,402,000.00
West Virginia	32,000.00	1,000.00	.....	400.00	950.00	.....	31,000.00	120.00	25.00	105.00	.....	300,000.00
Wisconsin	75,922.00	14,501.00	.....	1,159.00	216.00	.....	486.00	0.93	302.00	6.00	3,631,026.00	†921,700.00
Wyoming	14,300.00	1,620.00	.....	38.00	.....	.....	12,670.00	.....	38.00	.....	502,448.00	585,000.00
Totals	1,439,297.69	324,798.65	25,897.42	28,713.36	22,179.73	682.53	667,499.8	626.45	39,886.47	7,566.67	$92,165,139.25	$51,991,449.36

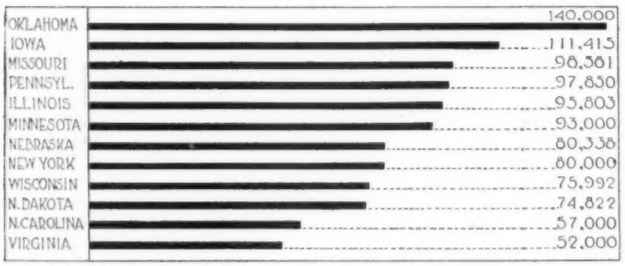
†Not including town and county share. F—Nine counties out of 52. K—Thirteen counties out of 120.
s—State highways. a—Approximate. *Bond issue. c—From county funds.
sc—state and county.

do not feel able to equal their share of the amount during the war period.

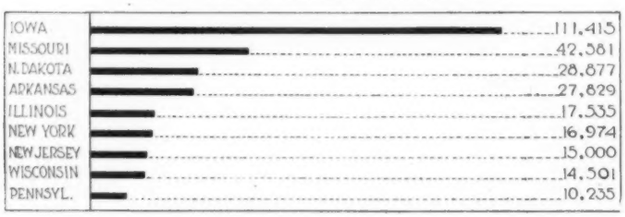
Better Organization Effected

Meanwhile many States are bettering the organization of their road work. The new Federal road law specifies that a State must have a highway department before it can share in the national appropriation. South Carolina has recently organized a highway commission. Georgia is at present in an unusual situation, because its constitution prohibits the State from making any direct appropriation for any internal improvements. Georgia has a highway department, however, and it may be that the counties jointly will agree to contribute a certain sum for road work in the State so that Georgia will get its share of the Federal grant.

Another opportunity for better organization is the standardization of statistics. Minnesota, New York, Illinois, Pennsylvania and a number of other States have complete and accurate statistics on the mileage of roads, the total appropriations from all sources, and the extent of various types of roads to be found in the State. Kentucky, Florida, Georgia and Ohio, however, keep no State records of the work done by the respective counties. In the two first-named States all records are kept by the separate counties.



Total mileage of roads in the twelve leading States at the end of 1916. All have over 50,000 miles of road



Miles of improved road in use at the end of 1916 in the nine States having over 10,000 miles of improved highways

In nearly every State in the Union there is decentralization of power with regard to road building and road administration. Five types of roads are to be found in practically every State: State roads, State aid roads where the central power bears part of the expense, county roads, town roads and abandoned roads. Probably home-rule in road building, especially as it applies to city highways, will continue in force; but a centralization of bookkeeping so that the State would know the total of road-building activities within its borders would be a help to all parties interested and to the public at large.

Financing Methods Vary

There seems to be no common trend in the method of financing roads. California and New Jersey, the two States that are planning especially large developments in the next few years, differ in their method of meeting the situation. California has voted a bond issue of $15,000,000. New Jersey's plan is to raise the funds by taxes on personal property and realty. In all States the automobile and truck fees contribute to the maintenance of highways. Toll roads are maintained in some of the Southern States.

Thirty-three States have reported an expenditure for roads of $92,165,139.25 during 1916. This sum, however, represents but a part of the amount appropriated in that group of States, and but a fraction of the amount devoted to the purpose by the nation. The $92,165,139.25 is the aggregate of the various totals reported by each State as the sum spent for road work; but the method of arriving at a total differs in practically every case. For instance: Bridge work is included under North Dakota's total, it is not included in Iowa's total. Many States do not specify whether or not they include bridge work under the cost of roads column. Minnesota's total is an estimate of the entire amount spent by all road authorities in the State, either central, county or

Road Statistics for United States for 1915

State	Total Miles of Roads in State	Total Miles Improved Roads	Miles of New Roads Built in 1915	Miles of Improved Roads Built in 1915	Miles of Macadam Roads in State	Miles of Bituminous Macadam	Miles of Dirt Roads in State	Miles of Brick Roads in State	Miles of Gravel Roads in State	Miles of Other Roads in State	Amount Expended for Roads in 1915	Amount Appropriated for Roads in 1916
Arizona	10,500.00	215.00	70.00	.....	.....	.....	.....	.....	.....	.....	$441,202.17	.....
Colorado	30,733.00	a6,300.00	.....	.....	.....	.....	.....	.....	.....	.....	1,762,293.16	.....
Connecticut	a12,000.00	s1,425.77	60.00	.....	.....	.....	.....	.....	.....	.....	1,871,131.16	.....
Dist. of Col.	510.19	510.19	5.4	.....	124.36	.....	.....	.....	161.42	.....	.....	.....
FloridaF	3,705.00	1,725.00	160.00	135.00	520.00	.....	2,405.00	.....	.....	129.00	555,764.52	.....
Illinois	95,803.00	s17,535.6	.....	a150.00	.....	.....	.....	.....	.....	.....	s1,000,000.00	.....
Iowa	111,415.00	111,415.00	.....	.....	.....	.....	111,233.00	.....	182.00	.....	3,396,365.00	.....
KentuckyK	4,709.00	1,116.00	58.00	73.00	284.00	.....	3,508.00	.....	75.00	.....	302,575.00	.....
Maine	25,530.00	1,112.16	246.40	246.40	48.99	40.13	24,417.8	.....	899.08	124.16	1,418,901.62	.....
Maryland	15,582.00	946.20	.....	220.00	600.02	.....	.....	1.62	136.60	207.96	2,200,000.00	.....
Massachusetts	a23,000.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	s2,051,000.00	.....
Michigan	.....	3,196.00	.....	759.00	789.00	.....	.....	.1	2,059.00	.....	9,164,609.07	.....
Minnesota	a92,000.00	.....	a500.00	412.12	.....	.....	.....	.....	.....	.....	s2,167,851.90	.....
New Hampshire	15,116.00	1,150.19	.....	146.33	.....	.....	.....	.....	.....	.....	1,200,000.00	.....
New Jersey	20,445.44	15,270.80	s52.9	.....	3,171.68	472.77	6,123.24	143.05	3,598.44	6,081.00	ac3,410,225.59	.....
New Mexico	.....	.....	174.8	.....	.....	.....	.....	.....	.....	.....	531,000.00	.....
New York	80,000.00	5,960.00	.....	759.00	sc5,090.00	.....	74,040.00	240.00	125.00	505.00	10,367,376.48	.....
North Dakota	68,000.00	26,250.00	5,382.00	2,375.00	.....	.....	67,045.00	.....	955.00	.....	2,470,000.00	.....
Oklahoma	140,000.00	.....	3,000.00	3,000.00	.....	.....	.....	.....	.....	.....	1,720,000.00	.....
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,900,000.00	.....
Pennsylvania	a97,000.00	a10,000.00	573.31	573.31	.....	.....	.....	.....	.....	.....	s3,000,000.00	.....
Rhode Island	2,200.00	325.00	.....	.....	325.00	.....	.....	.....	.....	.....	198,572.00	.....
South Dakota	96,306.00	17,071.5	.....	.....	10.00	.....	95,000.00	.....	212.00	141.00	.....	.....
Utah	2,892.00	1,807.00	.....	.....	35.00	5.00	2,347.00	.....	432.00	35.00	463,100.00	.....
Virginia	52,000.00	3,762.00	.....	.....	1,185.01	39.60	1,921.54	.....	637.50	.....	1,968,675.99	.....
Washington	42,428.00	5,460.00	1,100.00	.....	637.00	.....	37,600.00	.....	240.00	3,925.00	8,000,000.00	.....
West Virginia	32,000.00	600.00	.....	200.00	.....	.....	.....	.....	.....	.....	.....	.....
Wisconsin	.....	.....	.....	1,130.00	262.00	.....	559.00	1.26	271.00	.....	3,764,465.00	.....
Wyoming	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	436,290.00	.....
Totals	1,073,874.63	233,153.42	11,352.81	10,179.16	23,082.06	557.50	426,199.58	385.93	9,984.04	11,148.12	71,632,529.82	.....

†Not including town and county share. F—Nine counties out of 52. K—Thirteen counties out of 120. s—State highways.
a—Approximate. *Bond issue. c—From county funds.
sc—state and county.

town. The New Jersey sum represents the approximate total of county funds expended for repairs and resurfacing.

Although as an absolute sum the figure $92,165,139.25 has little significance, yet comparatively it means a good deal. It shows an increase of over $20,000,000 in road expenditure over the thirty-three States which reported in 1915. The variety of ways of stating the totals, moreover, shows the need of standardization of reports of this type.

Total Mileage 1,439,297

The total reported road mileage in these States is 1,439,297. Needless to state, however, this does not approximate the actual total in the country. It does not include Texas, the largest State in the Union; nor Kansas, known to have a mileage in excess of 112,000; nor Alabama, the road mileage of which is over 50,000.

Oklahoma the Leader

Oklahoma, the youngest State in the Union, is the leader in mileage among the thirty-three States, with a total of 140,000. Iowa is next with 111,415; Missouri next with 98,581; then Pennsylvania with 97,850; Illinois with 95,803; Minnesota with 93,000, and New York with 80,000. Out of the grand total, 324,298.65 were reported to be improved roads. The definition of an improved road, however, is elastic. Generally it means a road having a surface different from that of the land adjacent. In Iowa, where the dirt roads are dragged with a King drag after each rain, the entire system is considered by the highway department to be made up of improved roads. New York, on the other hand, means a specially surfaced highway by the term improved road, having a macadam, brick, concrete or gravel top. There are approximately 17,000 miles of that type of road in New York.

Gravel Roads Popular

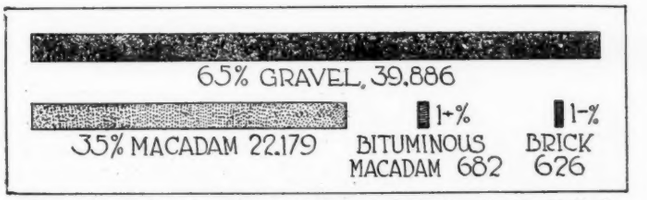
Gravel is one of the most popular surfacing materials. There were 39,886.47 miles of this type of surface reported in 1916. Macadam was next, having 22,179.73 miles of road surface; bituminous macadam is also used to a certain extent, there being 682.53 miles reported. There are at least 626 miles of brick road surface in these thirty-three States, though practically all of the brick construction is in New York, New Jersey and Pennsylvania. New York has 270 miles of brick road, New Jersey 143 and Pennsylvania 45.9. Dirt roads are the most usual type. Out of the total 667,499.8 miles were reported to be unimproved dirt roads. When to this number is added the dirt roads which are dragged the total will probably be well over 1,000,000.

Iowa's Good Record

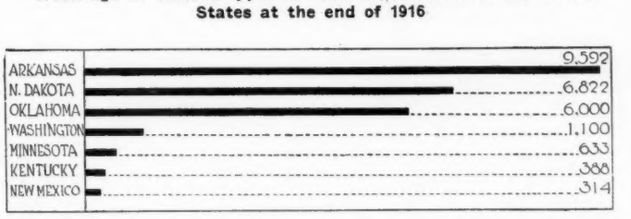
Iowa has an unusually satisfactory road system. With its 111,415 miles of roadway, it is among the first half dozen States of the Union for total miles. With that entire area made up of improved roads, it is the leader in improved roads. The District of Columbia also has a highway system which is 100 per cent improved; but that is hardly more than to be expected of the limited territory in which the national capital is situated. Iowa, to be sure, is especially favored by nature in the matter of roads. Its soil is of such a nature as to form a good road surface under simple treatment. There are only 277 miles of Iowa roads which have a special surface, and these all have a gravel superstratum. Iowa's road fees in the future will probably not go to the increase of her total mileage, but rather to the maintenance and surfacing of existing roads. Ninety-five miles of Iowa roads were gravel-surfaced in 1916.

Millions Spent for Bridges

Iowa, furthermore, is spending millions of dollars annually for bridges, which the highway commission does not include under its road expenditures total. During 1916 the



Percentage of various types of road construction in the United States at the end of 1916



Miles of new roads built in seven States leading in this respect in 1916

State authorities spent $7,172,000 for bridge construction and repair, of which $5,248,000 was for new construction.

Progress in Road Construction

Comparison of road statistics for a period of two years does not give an adequate picture of road history in any State. In many States, such as Connecticut and Pennsylvania, the road appropriations and reports cover a 2-year period, so that 1915 and 1916 are practically one fiscal unit rather than two units which can be profitably compared. New York's appropriation for roads in 1916 was about half that of the year before; but New York has been following a long-run policy, in which the funds expended during any given year are not especially significant. In the past 19 years the State has expended or pledged over $120,000,000 in road construction. In 1905 occurred the first of two great highway bond issues which amount to date to $100,000,000. The first issue was equal to half the total, and another issue of $50,000,000 was voted in 1913. A sinking fund of 2 per cent annually is laid aside each year to redeem these bonds.

New York's Apportionment Method

On State macadam roads, of which New York has about 10,000 miles, or the largest of any State in the Union, the State, county, and town pay respectively 50, 35 and 15 per cent of the cost. Where, however, a road is part of a county highway system the county pays half the cost and the State half. Another feature of New York's road financing is the method of dealing with grade crossings. Here the railroad affected must pay half the cost and the State the other half.

Prison Labor's Future in Doubt

Prison labor is used by many States of the Union, and from the standpoint of both the State highway departments, the lower labor cost resulting, and the benefit to the future, it is unquestionably desirable. There is strong political opposition in many quarters to this system, however, because of the contention by organized labor that the introduction of convicts at a wage with which the free man cannot compete is destructive to the equilibrium of the labor market, takes jobs away from the free worker, and tends to lower wages.

In New York, prison labor on State and county highways is not possible because all the work is done by contract. Many of the towns, however, employ convicts. Road material, however, is being turned out in small quantities by the convicts of Great Meadow Prison at Comstock, which is located near a high-grade dolomite limestone quarry.

All the Georgia roads, on the other hand, employ prison labor. Washington, Ohio, Oregon, California, Colorado, Virginia, West Virginia and other States employ convicts on road work.

Citizens Build North Carolina Roads

North Carolina is unique in its systems of road building and maintenance. It is the duty of every male citizen to work an assigned time, usually about 6 days, on the State road. He can meet this obligation either by putting in the required time or paying an equivalent. Public opinion and tradition are so strong in most parts of the State, however, that the man who pays some one to do his civic duty for him is considered a "slacker," and the majority of citizens willingly serve their time at road work.

Future Prospects

At the present time, reports from the State highway commissioners indicate that a period of activity in road work is to be expected in the next few years, especially if the war comes to a conclusion within a year or two. Pennsylvania is pledged to a road building era by the Brumbaugh administration; Massachusetts, Connecticut and New York are expecting an era of larger road construction. The last State especially expects to push the matter of eliminating grade crossings. Alabama, Indiana, Kansas, Tennessee and Vermont are looking forward to an active year. The appropriations so far authorized for 1917 amount to $51,901,449.36 in thirty-three States. It is possible that the great impetus in highway construction will not be markedly apparent in the current year; but by 1919 hundreds of millions of dollars will have been spent, adding thousands of miles of roadways to the nation's transportation facilities.

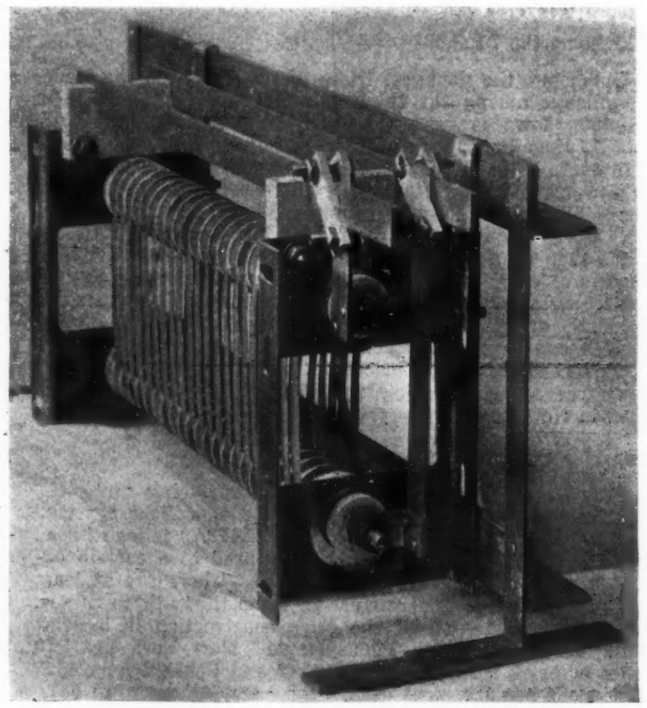
New Westinghouse Electric Heater for Enameling

THE new Type C Westinghouse oven heater has a heating element consisting of a ribbon wound on a number of fire clay bushings assembled on two steel tie rods, between two pressed steel end plates. The ends of the ribbon are secured to drop forged steel terminals which are clamped to the steel tie rods, the rods therefore becoming the terminals for the heaters. These rods are insulated from the end frames where they pass through same, and the ends are threaded for bolting on the connectors.

Connectors are made of ⅛ by 1 in. cold rolled steel. A large number are made standard and may be supplied directly from a stock along with the heater. Special connectors are furnished to meet the requirements. Cold rolled steel bus bars are recommended, and may be mounted directly above the heater on insulators bolted directly to the end frames. Connectors are secured to bus bars by steel clamps.

Hooks are used for hanging the heaters on to the usual supporting steel work, which may be flat iron, angle or channel iron or pipe work. The hooks are bolted to the flanged end plates of the heaters. Protecting screens may be attached directly to the flanged end plates, without any other means of support.

Heaters may be mounted either on the side walls or on the floor, and in any position. They are normally rated at 2.5 kilowatts at 120 volts. Any number of these heaters may be installed in an oven, and connected to any power circuit which may be normally supplied: single phase; polyphase; 110-220 or 440 volts. On 220 volt service, two heaters are connected in series and on 440 volt service four heaters are connected in series. Where three phase power circuits are used, the heaters are connected three phase, with the phases balanced. This heater is made by the Westinghouse Electric & Mfg. Co., of East Pittsburgh, Pa.



Westinghouse electric heater for enameling ovens

1917 Tractor Development—IV

Traction Attachments for Wheels Crude and Undeveloped—Need for Easily Adjustable or Interchangeable Devices—Could Economize Power by Careful Study of Driving Bar Form

By A. Ludlow Clayden

WHILE there is now no doubt that the conventional type of tractor for some years to come at least will have four wheels, there is considerable difference of opinion as to the best dimensions for those wheels. It is recognized that there must be some limits of diameter and width which will make the best equipment for a machine of given power, and the desire to discover what these are is strengthened by the knowledge that standard sizes for wheels would reduce the cost of wheels quite considerably.

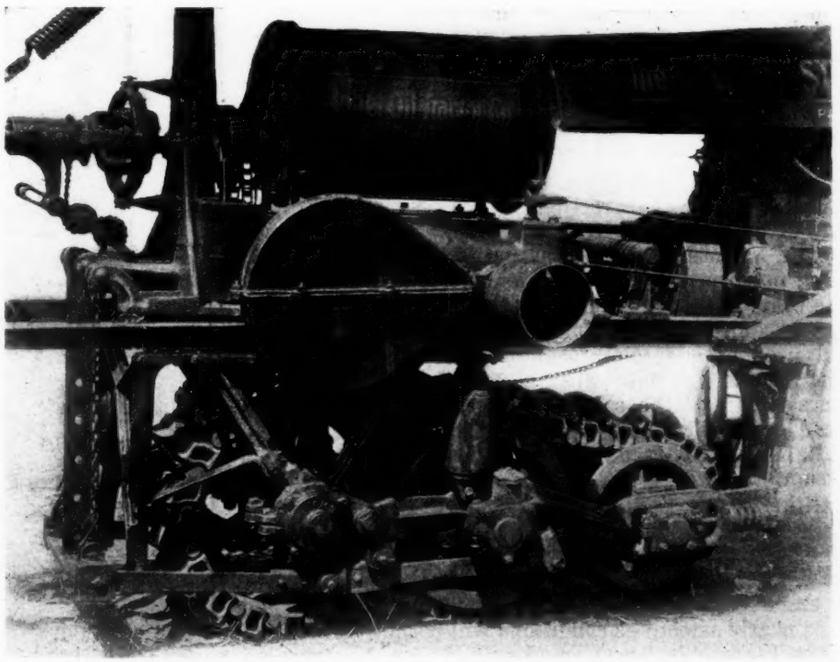
From the viewpoint of efficiency the smallest possible wheel is desirable. Firstly it is lighter and secondly the gear reduction required decreases as the diameter of the wheel is lessened. At present, rear wheels run anywhere from 40 to 60 in. and the deciding factor appears usually to be the clearance desired.

There are one or two machines being built to give high clearance with small wheels, practically every part of the running gear being above the axle centers, but they are the exceptions. Also, a wide, small wheel, even though it gives the same unit pressure on the ground, is not the tractive equivalent of a larger wheel with a narrower tread, owing to the better "rolling qualities" of the big diameter.

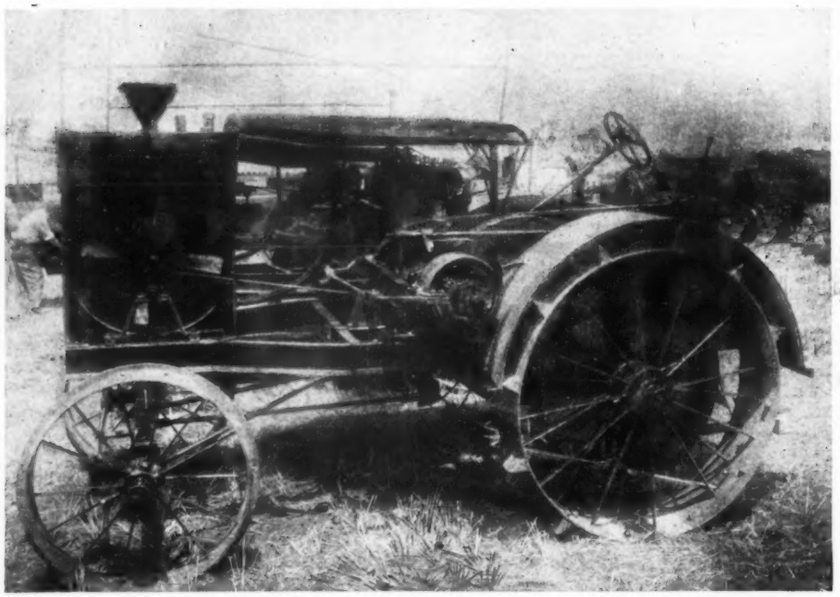
Machines have been, and are being, tried with more than four wheels, but the addition of extra wheels adds much more complication as a rule than a chain tread. It is hardly practical to drive more than two wheels of a six-wheel vehicle and still obtain reasonably good steering properties, without an elaboration of drive and control which is bound to be wasteful of power.

Probably there is room for much to be done in the design of wheel treads, and the capabilities of two-wheel drive will not be known fully till much more experimentation has been made along this line. At present the driving bars or studs fitted are generally very crude. One sees all sorts of arrangements, and it was noticeable at Fremont this year how several tractors had increased provision to reduce side slip as well as to give straight forward adhesion. It was equally obvious in the plowing that few, if any, of the wheels were immune from clogging. In Europe, where average humidity is greater than in most parts of the United States and clay soil is common, traction has been one of the principal troubles, and better traction would, of course, always be obtained if the gripping devices were self-clearing. Between the plain wheel with bars bolted to it and the walking wheel or pedrail which puts feet on the ground there is a wide range wherein experiment seems to have been neglected. The drawback of the pedrail is the large number of moving parts, coupled with an almost impossible condition for lubrication; the wheel is necessarily heavy, and it takes power to operate. A possibility which suggests itself as having some promise is a self-clearing wheel which can eject accumulations of mud between the tread bars, as this would not require much power, but probably all that is necessary is to discover the best form of gripping device.

In this connection it is easy to see how some of the treads act like a digging machine, being so shaped that they can hardly hope to avoid lifting soil, while others with equally good tractive features do not tend to clog so rapidly. As a matter of general statement, the worst offenders in the way of clogging are the tread bars made from angle-iron strips bolted to the rims. These have sharp corners and even the bolt heads help to form a base upon which pads of straw and mud will be built up. The large diameter round spike is not so bad, as it presents nothing rough for the vegetable matter to get a grip upon. Similarly tread bars of wedge shape sec-



The chain on the Bates Steel Mule has a deep bar for giving traction on each link. The opening action as the chain goes over the sprockets makes it difficult for dirt to clog



This tractor, the "Allwork," has a form of stud which does not clog easily

tion which are attached from the inside of the rim and do not employ bolt heads on the outer circumference do not clog readily.

It is easy to see why this is. The composition of the substance which actually does the clogging is straw and other vegetable matter bound with mud. As the wheel rolls, each successive space between tread bars punches out and compresses a pad of dirt. If the sides of the bars are smooth, this pad easily falls out as the wheel rolls forward, but if there are bolt heads or projections these act as pins to hold the pad in place. If it makes one complete revolution and picks up a second load the chances of the pad ever coming out unaided are small.

All this is very elementary, but the point desired to be made is that a very sharp bar, which gives the maximum grip when clean, will usually soon lose its effectiveness; a more rounded gripping device may easily do better on the whole, though having less maximum grip.

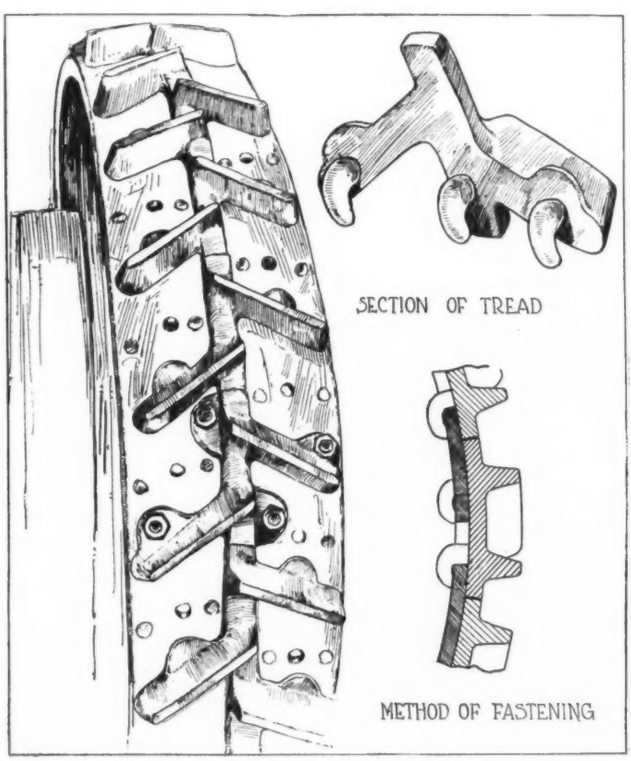
There is a great deal to be said in favor of adjustable or easily changed traction devices. It is unthinkable that a single design can be found to suit all soils and all states of weather, and this means that the bolted or riveted tread bar will be bound to disappear. At Fremont there were only two traction devices possessing any degree of detachability. One was an accessory exhibit and allowed the use of almost any pattern of grip, changing being performed with a light hammer and a single bolt. The other appeared on one of the tractors exhibited and was not quite so neat, requiring four bolts to be removed and needing a special form of wheel rim, which the other device did not. Still, either of these schemes is years ahead of the conventional practice. To bolt on tread bars individually is worse than the earlier pneumatic tires which had a bolt for about each 2 in. of rim circumference.

Hitherto the facility for changing traction devices easily has been advocated mainly because of the damage done to road and tractor by running on macadam with the bars attached, but this is really only one advantage. To economize power as much as possible the wheel should be as nearly smooth as conditions will permit. For plowing on reasonably firm ground only shallow bars are required, and to make them deeper than necessary is merely to waste fuel in doing unnecessary work. This means that a farmer could employ two or three grades of bar with advantage, using the one which suited the ground and the weather best.

A recent invention, which appears to have some promise, incorporates a traction rim which can be closed to form a smooth circle, or can be broken up into ridges, adjustment permitting these steps to be the equivalent of bars from 1 to 6 in. deep. Of course, the cost would be much greater than that of the plain wheel, but the advantage would be very real. Things of this sort usually start by being complicated and heavy, and develop with use till they are light and simple; but to obtain the ideal tractor wheel it will be necessary that manufacturers give some small encouragement to inventors.

Probably a device which provides different degrees of grip and can be set and locked permanently when adjusted to the degree desired is more likely to make good than anything in which there are moving parts always in motion. The possibilities of the latter begin where those of the former end. The one obvious thing is that the conventional tread bar with individual attachment has got to disappear.

Of course, if rotary implements appear, as suggested by Mr. Yerkes, they may completely alter the traction problem. In France rotary plows are being used which themselves do most of the driving, and there is no traction problem in their case.



Easily detachable tread on one of the International Harvester machines. Each section is secured by the hooks through the rim, the whole series being locked by the last section, which is bolted

Wallis Tractor Has Novel Frame

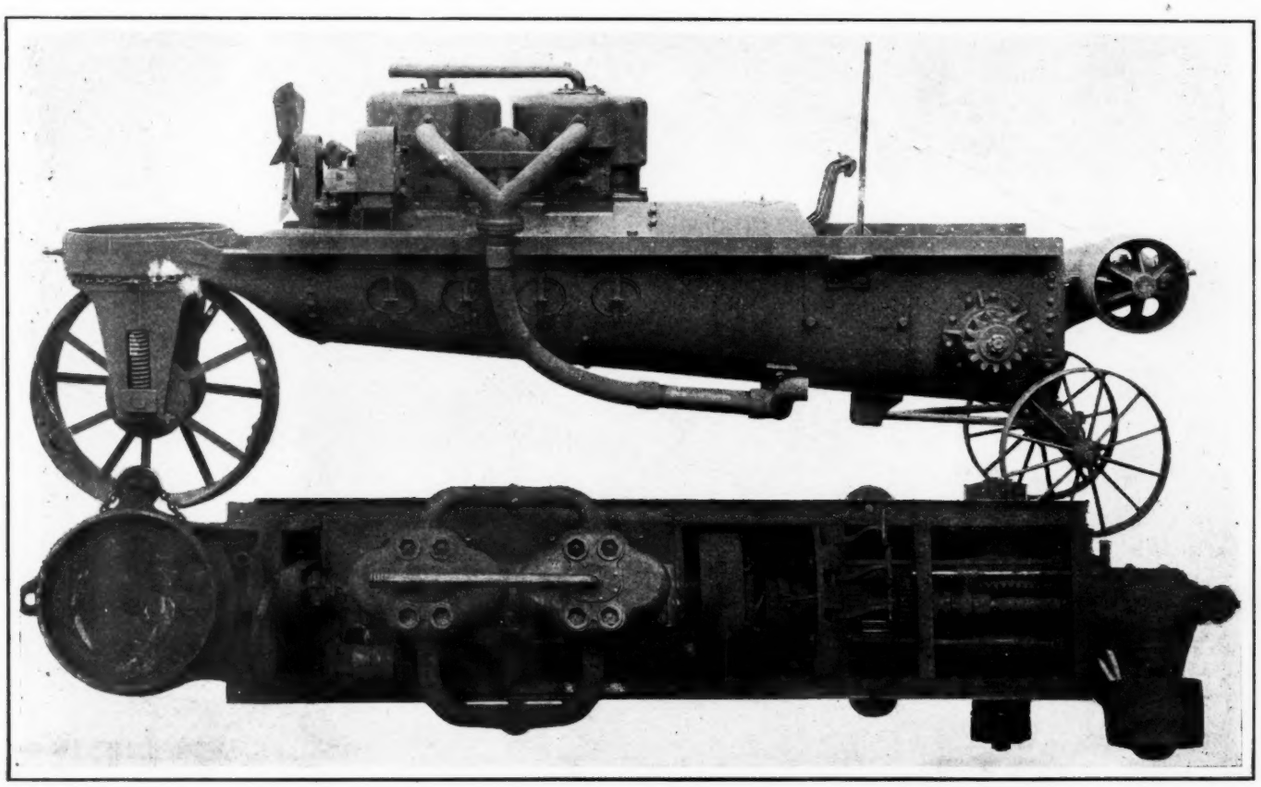
Frame Structure Composed of a Boiler Plate Bent Into Semi-Cylindrical Shape and Two *Z* Plates Riveted to It—Three-Wheel Construction with Ball-Bearing Steering Yoke

UNIQUE frame construction, whereby an underpan forming more than one-half of the engine crankcase and almost the whole of the transmission and differential gear housings is built integral with the frame, is the outstanding constructional feature of the three-wheel Wallis Cub tractor, manufactured by the Wallis Tractor Co., Racine, Wis., and distributed exclusively by the J. I. Case Plow Co., of the same city. This construction gives a rigid frame, affords some of the advantages of a unit power plant, and eliminates considerable weight.

The engine of this tractor is of the four-cylinder vertical type with T-head cylinders cast in pairs and bolted to a cast-iron crankcase. The crankcase is of unusual form in that the joint between the upper cast portion and the lower plate portion is some distance above the crankshaft axis. Partition walls are cast integral with the top part for carrying the intermediate crankshaft bearings, which are thus supported from the top half of the case, so that wear can be readily taken up by adjusting the bearing caps. The cylinders have a bore of 6 in. and a stroke of 7 in., which is equivalent to a piston displacement of 792 cu. in., and the engine develops 52 brake horsepower at its normal speed of 650 r.p.m. Both the inlet and the exhaust valves of each pair of cylinders are siamesed, so that there is a minimum of pipe joints to the cylinders. The crankshaft is very rigidly supported in five substantial bearings, the bearing at the flywheel end being especially long. One point is which this engine differs from others of the T-head type is that only a single camshaft is used for operating both inlet and exhaust valves. This camshaft is made from a drop forging and has the cams forged integral with it. It is 1½ in. in diameter and is supported in three large bearings. Both the bearing surfaces and the cams are case hardened and the latter are ground to exact size with the aid of a master cam. The crankshaft is also of very rugged construction, its crankpins and main journals being 2¾ in. in diameter, and the total length of the five main bearings, 26¼ in.

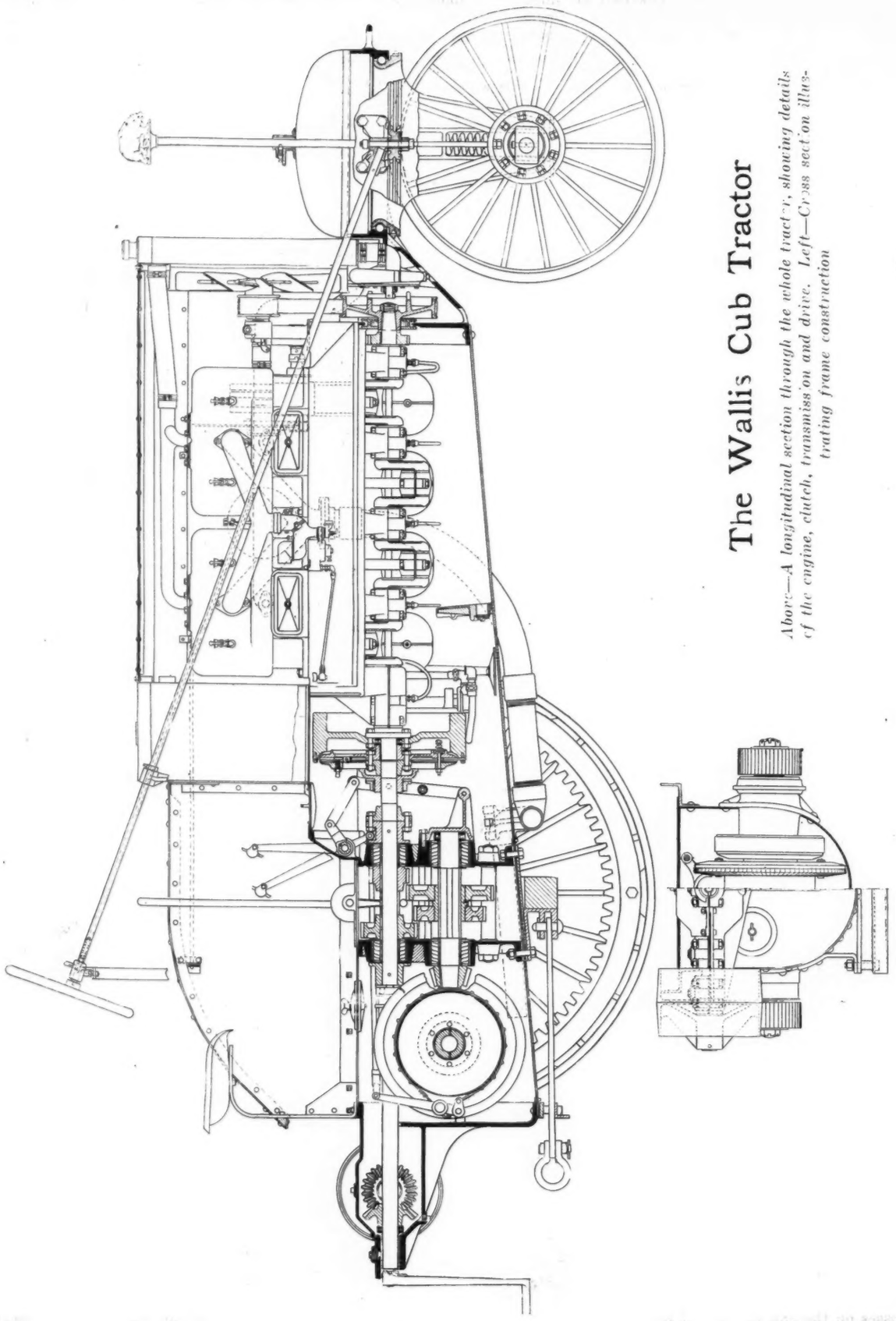
Ample Bearing Surface

Pistons of standard type are employed and are connected to the crankshaft by means of forged connecting-rods. There are three eccentric piston rings on each piston above the piston pin, and three oil grooves below the pin, in addition to which the piston is relieved for a length equal to the piston pin diameter. Alloy steel bolts are used in the head of the connecting-rods, two per rod. The bushings in the connecting-rod head have a phosphor bronze shell which is babbitt lined, and these bushings are provided with flanges which take the place of dowel pins for the purpose of keeping them from turning in the rod. Liberal-sized oil grooves are cut in the bushings to insure perfect distribution of the oil over the whole bearing surface. The piston pins are made of 1⅝-in. low carbon steel tubing, are carbonized, hardened and ground, and are clamped in the top end of the connecting-rods. An effective bearing length of 4 in. is obtained, which is greater than if the pins were fastened in the piston bosses.



Side elevation and plan view of the Wallis Cub tractor, which clearly show the frame construction

The Wallis Cub Tractor



Above—A longitudinal section through the whole tractor, showing details of the engine, clutch, transmission and drive. Left—Cross section illustrating frame construction

The main bearings on the crankshaft are lined with babbitt which is poured integral with the crank casing and the bearing caps. This is done by means of a special babbitting arbor, and after the babbitt has been thoroughly peened and hardened the bearings are line-reamed with a special fixture and the crankshafts are then scraped to a seat. In this way perfect alignment of all the main bearings is insured.

Uses Gasoline or Kerosene

The Cub tractor can be operated either on kerosene or gasoline. When kerosene is to be used a Bennett gas producer is fitted and two tanks are carried on the tractor, a small tank for gasoline, to be used for starting, and a large tank of 30 gal. capacity for the kerosene. The charge is ignited by means of a high-tension magneto of K-W make which is provided with an impulse starter. This obviates the necessity of carrying a set of battery cells for starting and also makes it unnecessary to spin the large engine in starting in order to obtain an effective spark. The cooling water is circulated by means of a centrifugal pump located at the forward end of the crankshaft, through a copper core radiator of the cellular type, back of which is mounted a powerful belt-driven fan.

The method of driving the circulation pump from the crankshaft is of interest. To the forward end of the crankshaft is keyed the fan driving pulley, and the web of this pulley is provided with driving lugs, with a notch on which engages an arm pinned to the shaft of the pump. This makes provision for any want of alignment between the crankshaft and the pump shaft, and it also provides a safety link which will give way in case the pump is prevented from turning, as by being frozen up. Positive feed lubrication is employed for the engine. The sectional elevation of the tractor shown herewith clearly shows the oil leads connecting from a horizontal distributer pipe to the main bearings of the engine, and the crankshaft is drilled with oil holes conveying oil from the main bearings to the crankpin bearings. The oil is circulated by a gear pump located near the bottom of the crankcase at the rear end of the engine.

Hydraulic Type Governor

In order to prevent the engine being abused by racing, it is provided with a governor of the hydraulic type. The pressure of the water in the cooling system acts on a diaphragm, and the motion of this diaphragm is transmitted to the carbureter throttle which automatically opens and closes so as to keep the speed of the engine substantially constant irrespective of the load it carries. The speed at which the engine is to operate is fixed by the driver, who sets his throttle lever for that speed, and the governor will then act to maintain it.

Directly back of the engine and combined with the flywheel is the friction clutch, which is of the three-plate dry type. It is normally held in engagement by means of a set of eight coiled springs on bolts extending through the two outer clamping plates, which are thus forced together and in contact with the central driving plate. The latter is fastened to the flywheel rim by screws and is provided with copper-asbestos friction lining on both sides, the friction disks being secured to the driven saw steel disk by means of copper rivets. The clamping plates are secured to the coupling shaft. The clutch is disengaged by means of four fulcrum levers pivoted to the forward clamping plate. These levers are pressed against by a clutch collar which can be actuated by means of a clutch pedal. Thus the clutch on this tractor is normally held in engagement, in the same way as on an automobile, and the clutch pedal must be depressed in order to disengage the clutch.

Between the clutch and the transmission is interposed a short coupling shaft with universal joints of the square block type at both ends. Thus any disalignment between the engine and transmission will not cause binding of the bearings. The transmission gearset differs from the usual construction in that the case consists essentially of two end plates which are held in the proper relative position by means of three spacers, the ends of which are reduced in diameter, passed through bosses on the end plates and provided with nuts on the outside. Two forward speeds and one reverse are afforded by this gearset, a plowing speed of 2¼ m.p.h. and a road speed of 3½ to 4 m.p.h., besides the usual reverse speed. To obtain a speed of 2¼ m.p.h. with 650 r.p.m. of the engine and 5-ft. driving wheels requires a reduction ratio of more than 50 to 1, which is obtained in three steps.

No Direct Drive in Gearset

All shafts in the transmission, as well as those of the axles, are made of high carbon open-hearth steel and heat treated. The primary shaft on which the sliding pinions are mounted is provided with four integral keys on which the pinions slide. This shaft is heat treated and ground after having the keys milled on it. The gears are made of low carbon nickel steel, heat treated, carbonized and hardened, to obtain the maximum strength and wear. After completion the gears are tested for accuracy and also for hardness by means of a scleroscope. Both shafts of the gearset are carried in Hyatt roller bearings. The gearset is mounted independently of the frame and can be removed for repairs when required. The different gears are brought into action selectively by means of a single lever. It will be noticed that there is no direct drive in the gearset, the transmission of power in every case being from the primary or upper shaft to the secondary or lower shaft. To the rear end of this lower shaft is keyed a bevel pinion which meshes with a bevel crown gear on the differential on the jackshaft. The differential pinions and the bevel crown gear are made from the same material and treated in the same manner as the gears of the change-gear set. A feature of the differential gear design is that the thrust of the bevel gear cannot reach the differential bearings, being taken up entirely by a thrust roller mounted in the rear transmission header on a Hyatt roller bearing. This design permits of placing the differential spider in a floating position on the differential shaft. A brake drum is secured to each of the differential shafts, and brakes of the contracting band type act on these drums. The brake drums are made of pressed steel and the brake bands of strip steel and lined with copper-asbestos.

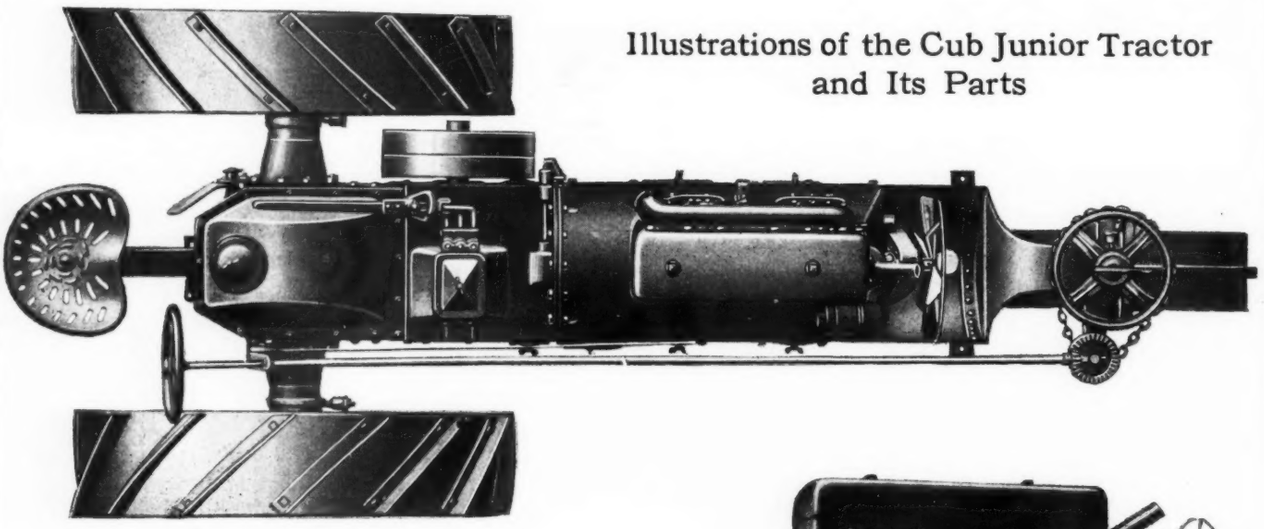
To the outer ends of the differential shaft are secured the bull pinions which engage with the internally toothed bull rings on the rear wheels. The jackshaft is mounted on Hyatt roller bearings carried in brackets secured to the U-shaped frame member. The back wall of the underpan construction is formed by a casting from which extends rearwardly a bracket in which is mounted a bevel gear for driving the belt pulley. Power is transmitted to this pulley through the main clutch, the primary shaft of the change gearset and an extension of same to the rear, on which is secured a bevel pinion meshing with a bevel pinion mounted in the bracket already referred to. This same shaft extension is used for cranking the engine from the rear of the tractor. The pulley is 14 in. in diameter by 9 in. width of face and runs at engine speed. It is controlled by means of the main clutch.

Some further details may here be given regarding the frame construction. The frame is made up of a plate of 3/16-in. boiler steel formed into U-shape, the upper edges of which are reinforced by means of Z plates. This is clearly shown by the part-sectional view of the differential gear and jackshaft herewith. The forward end of the trough formed by the U-shaped steel plate is closed by a casting forming the steering head, and the rear end is closed by a casting forming the power pulley bracket. There are a number of hand holes in the U-shaped plate which permit ready access to the connecting-rod bearing for purposes of adjustment.

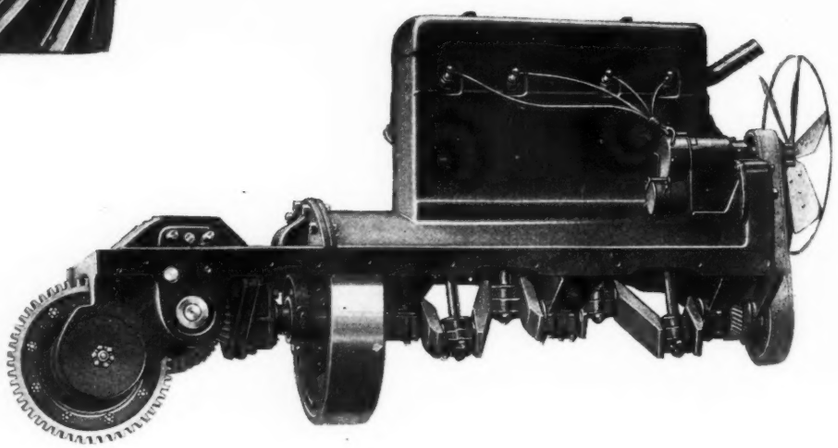
Steering by Front Wheel

The Wallis tractor is of the three-wheel type, having a single central steering wheel in front. The front steering wheel, which is 34 in. in diameter and has a 14-in. rim to which is fitted a single central skid band 1¼ in. square, is mounted on a vertical yoke which has a ball bearing support for the steering head of the frame. The front wheel is spring mounted, as is clearly shown in the illustration, and similar spring mountings are used for the rear wheels, though these are not visible in the cuts. Steering is effected by means of a hand wheel at the end of a steering shaft which is very strongly inclined and which operates at its forward end through the intermediary of a pair of bevel gears

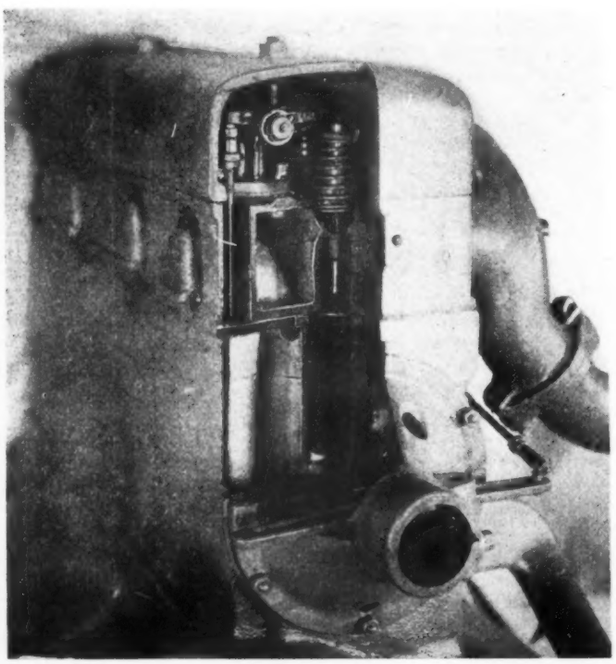
Illustrations of the Cub Junior Tractor and Its Parts



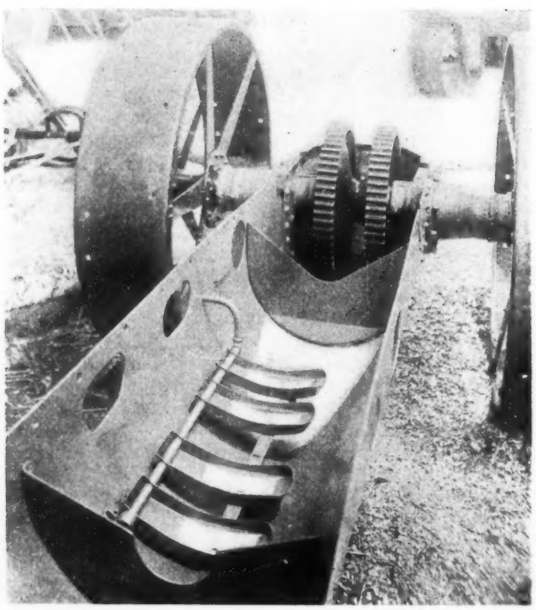
Above—Top view of the complete tractor, showing clean design



Right—Unit power plant of the Cub Junior, comprising a block engine



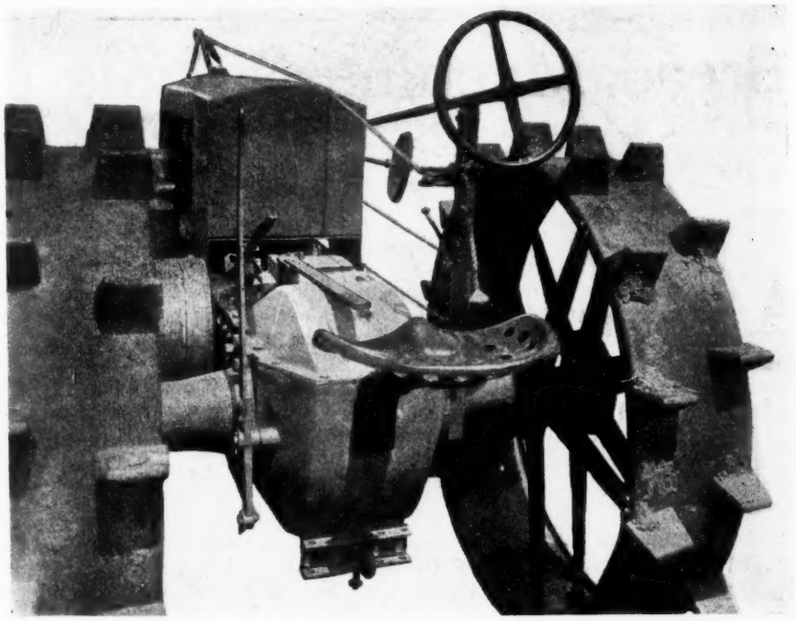
The Cub Junior engine has removable cylinder sleeves



Splash troughs are supported by the pipe which supplies the oil

on a chain wheel mounted on a vertical shaft. This chain wheel connects by means of an ordinary link chain with the circular rim of the vertical steering yoke. The bracket for the bevel gearset and chain pinion, of course, is secured to the steering head of the frame. The rear wheels are 60 in. in diameter and have a 20-in. face, but these may be widened by means of 7½-in. extension rims which are furnished extra when ordered. The rear wheels, too, are spring mounted. Of course, the range of spring action is comparatively slight, and as the bull rings on the rear wheels are very large in diameter the mesh of the pinions with them is not seriously interfered with by the spring action, especially since there is a link connection between the axle and the frame.

One of the features of construction on which great stress is laid by the manufacturer of the Wallis tractor is the accessibility of all the working parts. Reference has already been made to the port holes opposite the crankpin bearings, through which not only these bearings but also the crankshaft main bearings can be adjusted. There are also port holes over the engine valves. Then there is a plate over the clutch, which permits of adjusting the clutch without removing it and without making it necessary to get under the clutch, where there is bound to be dirt and where it is difficult to do effective work. There are also large plates over the transmission and the differential. By means of these plates it is possible to easily and quickly expose the entire mechanism of the respective parts to view. Through the opening over the differential the brake in the differential housing can be reached, though for mere adjustments it is not even necessary to remove this plate, as these may be effected through the rear hand hole in the back of the frame.

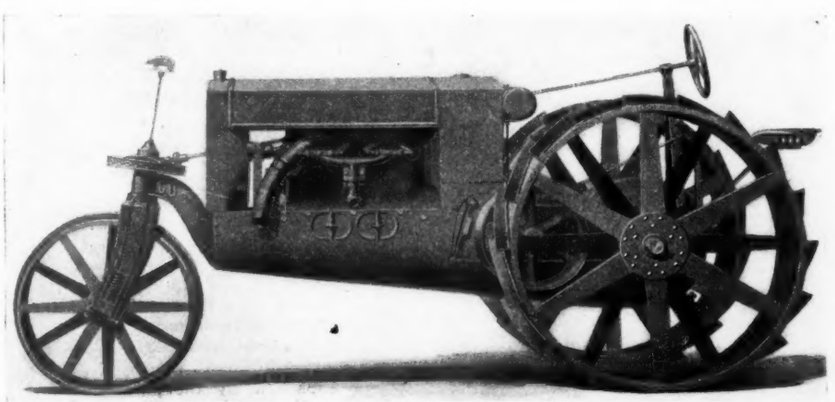


Rear view of Cub Junior, showing control members and enclosed drive

The Wallis Cub tractor has a wheelbase of 102⅜ in., an overall width of 74 in., an overall height of 87 in. and an overall length of 171 in. Its local weight is 8500 lb. and it will deliver a constant drawbar pull of 4000 lb. and a maximum pull of 5000 lb. The tractor is recommended for use on farms of over 300 acres.

In addition to the Cub tractor the Wallis Tractor Co. manufactures the Cub Junior, which is a somewhat smaller machine and of slightly different design. This tractor has a unit power plant in that the engine casting has the frame of the transmission bolted to it. The engine is of the four-cylinder block type and has its water jackets extending all the way down to the crankcase. It is of the four-cylinder type, with 4¼ by 5¾-in. cylinders. It is provided with removable cylinder sleeves which are inserted into the engine casting from the top. The valves are located in the head and actuated by a valve mechanism which is entirely inclosed. As in the larger engine, the main crankshaft and connecting-rod bearings can be adjusted through hand holes in the underpan. A hydraulic governor is combined with the fan bracket at the front of the engine. The fan is mounted on a Hyatt roller bearing and driven by a flat belt of liberal width directly from the crankshaft. In order to be able to get at the valves for grinding and to replace the cylinder liners when necessary, the cylinder heads are made detachable. The cylinder liner, which forms the entire cylinder wall, is machined from close-grained gray iron and is about 14 in. long. Being accurately machined both inside and out, it affords a cylinder wall of absolutely uniform thickness; hence there can be no distortion due to the heat.

On this model a clutch of the expanding-shoe type is used, which is incorporated in the flywheel and runs in oil. Adjustment for wear may easily be made. The expanding members of the clutch are faced with copper-asbestos fabric. Back of the clutch there is a bevel pinion set by which the power is transmitted to a transverse shaft. On this shaft are two pinions which are adapted to be meshed with gears on the differential shaft located behind it. By means of this gearset the usual two forward speeds and reverse are obtainable. The transmission is assembled as a separate unit which is bolted to the engine housing. Both of its shafts are carried in Hyatt roller bearings. On opposite sides of the differential are mounted two bull pinions which engage with the bull rings on the rear axle. The rear axle is of the live type, comprising a central housing of cast steel, which is riveted to the rear end of the frame. In this way the drive is completely inclosed. The belt pulley is mounted on an extension of the first transverse shaft; hence the belt power is controlled by the tractor clutch. All gears, including the master gears and bull pinions, are made of drop forgings from nickel steel and low carbon open-hearth steel, carbonized and hardened. Scleroscope tests are made to check the hardening. The belt pulley is 18 in. in diameter, with a 6-in. face, and as it is driven from the engine through a 2 to 1 reduction, its normal speed is 430 r.p.m., which is said to give the proper belt speed for operating all the standard farm machinery. Hyatt high-duty roller bearings are also used in the differential.



The Cub Junior complete. Note the springing of the fork

(*Continued on page* 431)

Bread Machine Mounts on Army Truck

Three-Ton Chassis Carries Machine with Capacity of 1000 to 6000 Loaves Per Hour —Will Be Used in Western Cantonment

AN automatic bread-making machine which mounts on a three-ton truck chassis has been developed by James Garvey and Ralph Hamlin of Los Angeles, Cal. An experimental model has been built and put on a Selden chassis and will be tried out at the Linda Vista cantonment near San Diego. Garvey is responsible for the bread-making portion of the machine and Hamlin for working out its application to the truck.

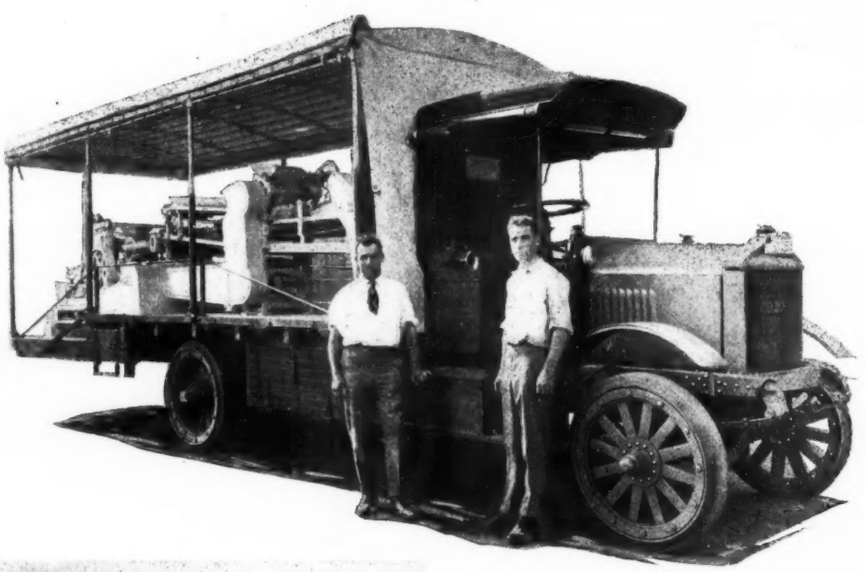
It is claimed for the Garvey automatic bread-making machine that it is the only unit machine in existence that will completely make a loaf of bread performing all the functions customary to hand work. It mixes the dough, then, after time has been allowed for the bread to raise, the machine rolls and kneads it, cuts the loaves into any size, shape or weight desired and discharges them into the baking pan ready for the oven. It will produce French, German or American bread without distinction, any alteration that is desired being brought about by manipulation of a simple hand wheel control.

The capacity of the outfit is minimum 1000 and maximum 6000 loaves of bread per hour. With five men assisting in feeding the ingredients into the mixer, directing the operation of the machine and removing the accumulated loaves, it is claimed to perform work now requiring 112 men. At present all army bread is made by hand in the field.

The outfit weighs somewhat more than three tons and is mounted on a standard 3½-ton Selden truck. The truck body measures 7½ ft. by 20 ft., with a 6-foot drop extension in the rear 9¼ in. below the other part of the body. The rear end is made lower so that the bread can be panned at standing height. There is the ordinary bakers' platform, cabinet and work bench.

When in transit, the platform folds up against one side of the truck. There is a canvas top that covers the entire outfit and canvas side and rear curtains. When set up for operation, the sides are extended, forming a tent 24 ft. wide and 28 ft. long.

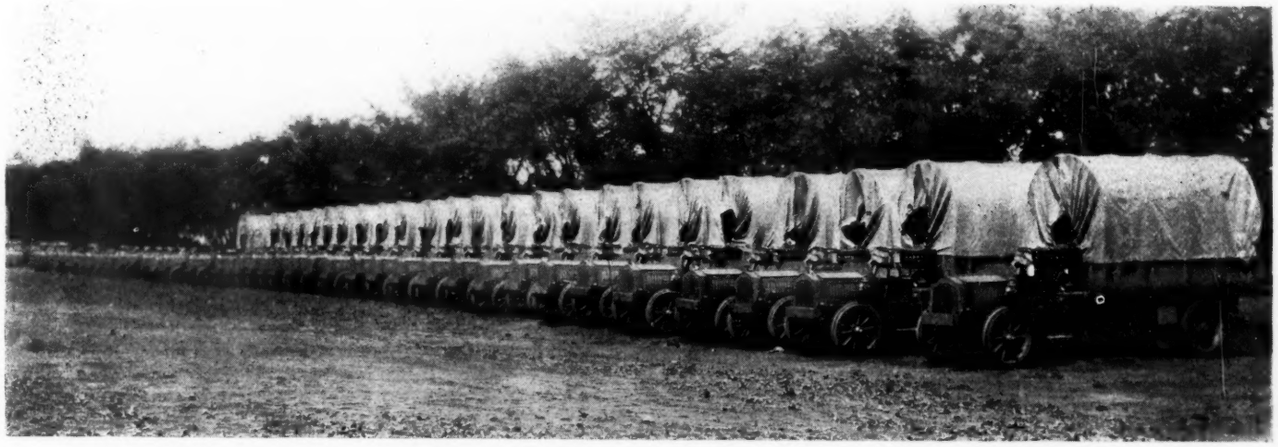
In camp, the bread-making machine may be operated either by the truck's engine or electric power, a special motor being provided for this purpose. An extended shaft from the truck's transmission drives the machinery that transmits the power to the jackshaft by roller chains and from that to the main shaft extending beneath the floor of the body. An engine speed of 500 r.p.m. will operate the bread maker. An auxiliary water tank is provided to help radiation. The electric power is used with the transmission in neutral and by separate clutch arrangement operated by a lever. Any single part of the machinery can be run separate from the other parts, so that the mixer alone can be run preparing the ingredients before the dough is ready for further working.



Above—Garvey automatic bread-making machine mounted on Selden chassis. It is said to be the only unit machine in existence that will completely make a loaf of bread, performing all the operations customary in hand work. Left—Ordinary bakers' platform, cabinet and work bench. In transit the platform folds up against one side of the truck

Training American Ambulance Drivers

High Efficiency Marks Allentown Camp System —Medical and Mechanical Instruction on Intensive Plan Prepares Men Rapidly



1½-ton Packards at U. S. Ambulance Corps camp, Allentown, Pa. Two of these trucks accompany each ambulance section

THE United States Ambulance Corps is a new organization which has absorbed all the Red Cross units, and its special mission is to work close behind the trenches in the first zone of operations. The men for this work, besides requiring a high courage and resourcefulness, must have some medical and a fair amount of mechanical knowledge. One of the objects in consolidating the Red Cross units was to provide identical training and equipment to all engaged in the work.

The camp was established at the fair grounds at Allentown, Pa., early in June. Since that time 5000 men have been undergoing intensified training. At this time there are about 4000 men at the encampment, the other 1000 having completed their course of instruction.

The camp is unusually well situated for the work because it makes use of the racetrack on the fair grounds for the instruction of the men in the operation and repair of the motor vehicles of the organization. On this track the driver gets his first instruction under good road conditions so that he can more easily master the rudiments of motor truck driving, repairing and maintenance. This work is later supplemented by experience secured on hikes throughout the surrounding territory where road and other conditions similar to those to be met with in France are encountered.

Some of the men in the camp are quartered in the grandstand facing the racetrack. Others are in tents and still others in the permanent wood or brick structures formerly used by the fair concessionaires to display their goods. Permanent steam-heated barracks similar to those erected at the National Army cantonments will soon be started so that the instruction work can be carried on during the winter months with the greatest degree of comfort for the men.

The space beneath the seats of the grandstand is utilized as an encampment mess hall. It will seat 2500 at one time and has a permanent concrete floor, which is washed at regular intervals and kept spotlessly clean.

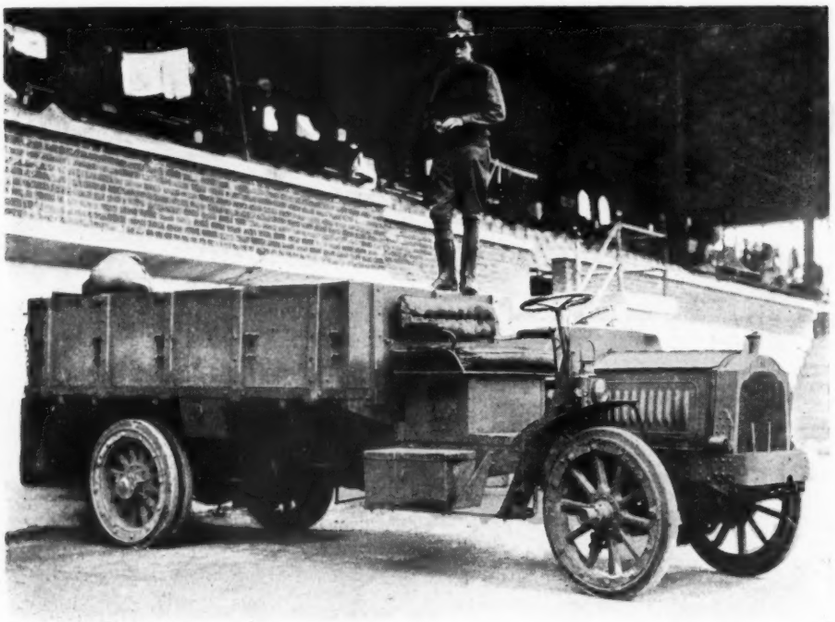
The vehicular equipment of the new organization is entirely motorized, the ambulances of which are exclusively Fords with the new standard type of United States army body, which is superior to any types heretofore used abroad on the same type of chassis.

The ambulances which were presented to various of the old Red Cross units by philanthropic organizations or by popular subscriptions have been shipped to Allentown but have not been taken over by the Government because of its determination to employ none but the Ford chassis with its new standard type of body for ambulance work. The other ambulances, which are mounted on ¾-ton White chassis, Smith Form-a-Trucks, etc., if taken over at all will not be used by the units to which they were presented, but will be employed farther behind the lines.

Ambulance Units from Many Universities

The men who came to Allentown with the ambulances comprise units from the universities of Columbia, Pennsylvania, Cornell, Princeton, Susquehanna, Indiana, California, Leland Stanford, Purdue, Virginia, Washington and Lee, Fordham, Michigan, Harvard, Johns Hopkins and others. At the present time each of these various university groups is working in the unit as originally formed, although it is not certain that it will be sent to France as such.

Two examples which give concrete proof of the highly efficient manner in which the camp is run may be had from the manner in which the Fords shipped knocked-down are assembled and in the manner in which the mess hall is run. A recent shipment of twenty Fords which came knocked-down in wooden crates, each holding two complete vehicles, was unpacked, assembled and equipped



The type of 1½-ton Packard which is standard equipment for the U. S. Ambulance Corps. These trucks carry all the equipment, including food, baggage and mechanical spares

in 8 hours, from 7 p. m. to 4 a. m., with an intermission of 1 hour for the midnight supper. These vehicles had to be assembled and their bodies applied in order that they might be shipped with a quota of ambulance units to leave the camp the following day. Due to the absence of any permanent illuminating system in the paddock inside the track where the Fords had to be assembled, all of the work was done within a circle formed by other completed Ford ambulances which had their head-lights tipped slightly so as to illuminate the inside of the ring.

The mess hall is unusual in that not one bit of food is wasted. Every scrap of food remaining on the plates at the mess hall is separated and then sold and converted into cash, which is used to buy delicacies not ordinarily provided. For instance, a special barrel is provided for the meat leavings, one for the fats, one for bones and still another for swill. As each private finishes his meal, he picks up his plate with its leavings and walks down in front of the special barrels and deposits the various bits of food into their respective places. Similarly, the knives and forks are dropped in another barrel and the cups in still another, so that the work of the dish washers may be reduced to a minimum.

The swill refuse is sold to nearby farms to be fed to pigs, and similarly the fats to a rendering concern in Philadelphia, which converts them into soap products. The bones are likewise sold to certain concerns for the manufacture of fertilizers.

The system of instruction given at Allentown includes lessons and demonstrations in the maintenance, care and operation of the vehicles of the ambulance corps and lectures and practical work in the methods of handling wounded in the field.

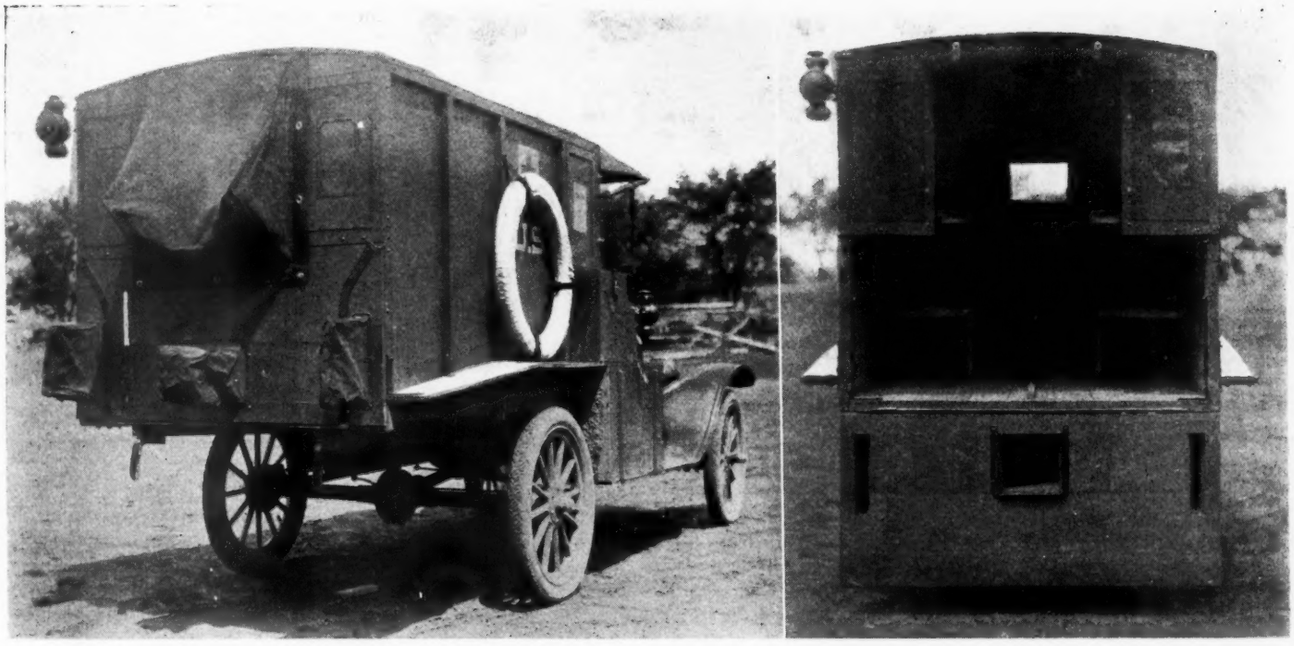
The instruction in the operation of the vehicles of the unit consists of a full course in driving and in taking down and putting together the various component parts of the vehicles. Every man must know how to drive properly, how to change tires quickly and how to make minor repairs.

The medical work consists of lectures on personal hygiene, tuberculosis, bacteriology, foot drills, bugle drills, litter drills, bearer drills and lessons in first aid to the injured. These various litter and bearer drills are carried out with human subjects in order that the men may learn just how to put a wounded man into the ambulance and take him out with the least trouble and with the greatest comfort to the patient.

Every man in the corps must be both a mechanic and a driver and must also be able to give first aid to the injured and place the wounded into the ambulance, for the reason that any man may be called upon to do any one or all of these tasks upon a moment's notice. Each man must complete this course to the satisfaction of the officers in charge and must be re-examined in any portions of it in which he fails on the first examination. The complete course usually takes from 2 to 3 weeks, after which time the men are sent out on hikes in the surrounding territory from time to time until they are called for service.

Up to the time this article was written, 160 ambulance sections had been authorized by the Government. Each section consists of forty-five men and twenty-six motor vehicles. The personnel consists of one commanding officer, four non-commissioned officers, one first sergeant, two duty sergeants, one corporal, one chief mechanic, two

One of these roller kitchens accompanies each ambulance section. It is hauled by one of the Packard trucks and is a new design which has just been accepted by the government



These two views show the standard Ford ambulance body standardized by the U. S. Ambulance Corps. Twenty of these cars form a section, which is completed by the two Packard trucks and one kitchen

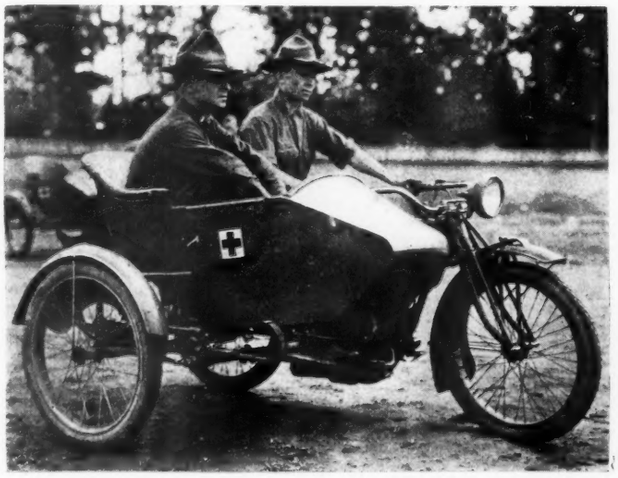
assistant mechanics and thirty-three vehicle and motorcycle drivers.

The vehicular equipment consists of twenty Ford ambulances, two Packard 1½-ton trucks, one Ford supply truck, one Ford passenger car for the officers, one motorcycle and side car and one roller kitchen hauled by one of the 1½-ton Packards. The two Packards are used to carry all of the food and baggage for the section, together with the spare parts for the vehicles. The roller kitchen has just been accepted by the Government. It is shown in one of the accompanying illustrations and is mounted on a Trailmobile, a four-wheeled trailer made by Sechler & Co., Cincinnati, Ohio.

Details of a Ford Ambulance

The new Ford ambulance body differs from all previous types used on the Ford chassis in its length, which is 1 ft. shorter than all previous designs. The difficulty encountered with previous Ford ambulance bodies to accommodate the standard length stretcher was occasioned by the extreme overhang of the body aft of the rear axle. This gave the vehicle very poor riding qualities and oftentimes caused very seriously wounded men excruciating pain when driving over rough roads.

The new American Ford ambulance body is 6 in. shorter than the standard stretchers which it carries. This seeming impossibility has been effected by the introduction of four canvas-covered holes in the rear end into which the rear ends of the stretchers extend. Three of these holes are in the lower half of the tailgate, which folds down to form a step to assist the men in putting the stretchers in the body. Two stretchers are carried on the floor of the body, the outside stretcher ends each extending into the holes on the outside and the two adjacent ends in the center hole, which is twice the size of those on the sides.



With each section there is a motorcycle and side car of the type illustrated

Accommodates Three Stretchers

Three stretchers are carried in the body, one at the center at about the mid-height of the body. Similar holes with canvas pockets are provided in the upper half of the rear hinged door to provide for the extending ends of the upper stretcher. The canvas pockets prevent the stretchers from slipping out while the vehicle is in motion. Fold-down slot-type seats are provided on each side of the body to accommodate seating patients if the stretchers are not employed.

204 Vehicles at Camp

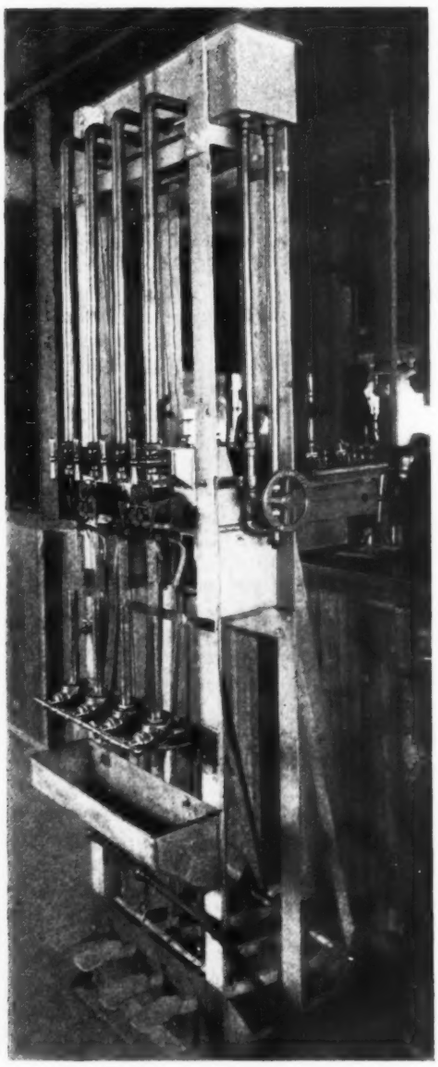
At the time this article was written, there was a total of 204 vehicles at the camp. Of these, 100 were 1½-ton Packards, some with the regular standard type of army bodies and others waiting to have their bodies applied. There were seventy Fords complete with bodies for instruction work; twenty Fords converted into longer wheelbase vehicles by means of Smith Form-a-Truck attachments; twenty Ford passenger cars and eight motorcycles with side cars. These latter are used for dispatch work about the camp and on the hikes.

Zenith Carbureter Production Increasing

Extreme Accuracy Necessary in Jet Sizes—Airplane Instruments Demand Maximum Care and Special Machinery

By J. Edward Schipper

THE addition of 15,000 sq. ft. to the factory space of the Zenith Carbureter Co., Detroit, which will be completed a short time after Oct. 1 this year, will bring the total manufacturing space of this concern up to 36,000 sq. ft. The Zenith Carbureter Co. is interesting because it represents the introduction into this country of an instrument designed originally in France, and then afterward adapted to the needs of cars in this country. The Zenith Carbureter Co. was organized in America in 1911. At this time it was incorporated with a capital of $10,000, and occupied 8000 sq. ft. of floor space in a Detroit power building. The present space is 21,000 sq. ft., and the addition of the 15,000 sq. ft. brings it up to the 36,000 sq. ft. total previously mentioned.



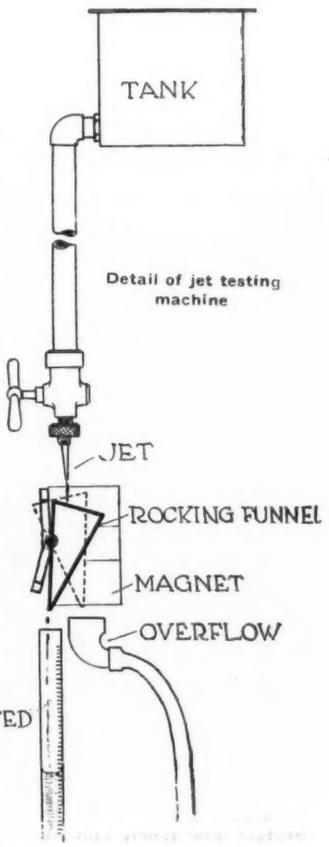
Apparatus for testing accuracy of Zenith jets. The upper tubes connect with an overhead tank where liquid is kept. On opening the cocks the liquid flows through the jets for a definite period of time, at the expiration of which the cocks automatically snap shut. Readings showing the amount of liquid passing through are taken on the calibrated glass tubes below

The 1917 production of the Zenith Carbureter Co. will be 210,000 carbureters at the close of the fiscal year. This factory is of importance in the war plans of the country owing to the extended use of internal-combustion engines in all branches of the service; and some of the equipment used in the plant is of particular interest owing to the ability to meet the requirements of the exact workmanship found in airplane practice. In this plant the carbureters for the Hispano-Suiza, Curtiss, and other airplane engines are being manufactured, and some of the processes required for this work rival the operations of watchmakers for their accuracy.

Two of these which may be described in detail, and which are illustrated herewith, are the checking of the jet sizes and the pointing of the float-feed needle valve. In order to check the sizes of the jet openings and to calibrate them, the jets are not measured by means of a gage, but by the flow through them in a definite time. One of these testing stands is shown herewith, with a clock behind it.

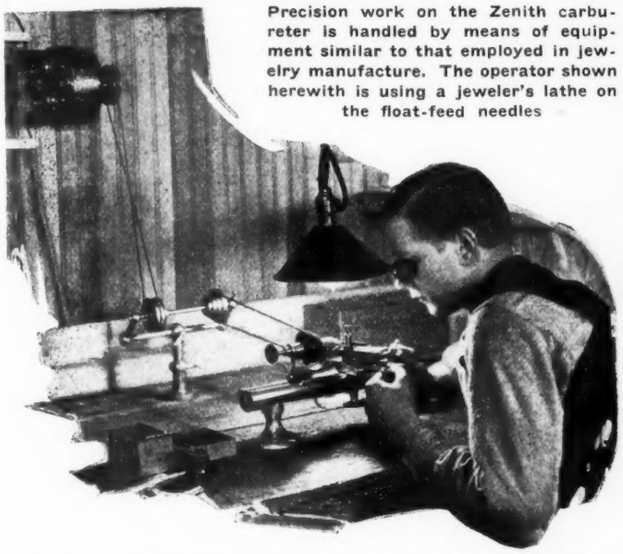
Check Is Automatic

As it will be noted, there are four sets of tubes in the testing stand connected with a tank for liquid above. At the bottom of the upper tube there is an attachment by means of which the jets can be inserted, and on each tube there is a cock which can be turned on when testing the jets. Below the cocks there is another set of four tubes, these being glass, and calibrated. The jets are inserted into the attachments and the cocks turned on, starting the liquid flowing through the jets to be tested. As soon as the flow starts the clockwork is set in operation, which permits the liquid to flow through for a definite amount of time, and when this has elapsed the clockwork stops the flow, so that it has only been going on for a predetermined length of time. This absolutely eliminates the human factor in timing the flow of liquid through the jets.

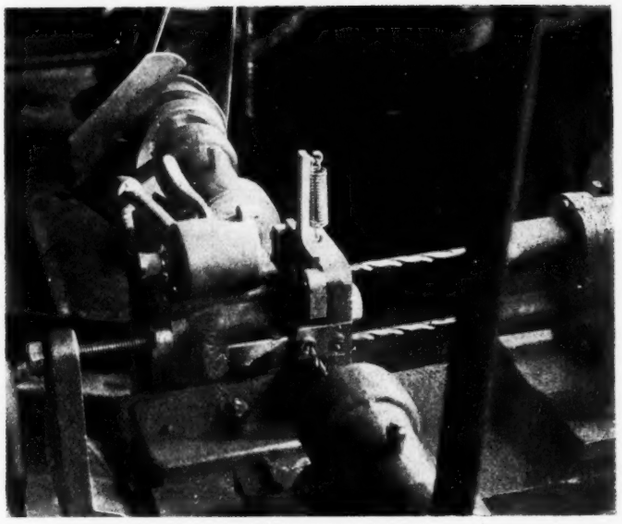


Detail of jet testing machine

When the flow is stopped, the amount of liquid which has run into the calibrated glass tube is a direct indication of the jet size. If there is too much liquid in the tube the jet is too large, and it is redrilled for the next size larger. If there is too little,



Precision work on the Zenith carbureter is handled by means of equipment similar to that employed in jewelry manufacture. The operator shown herewith is using a jeweler's lathe on the float-feed needles



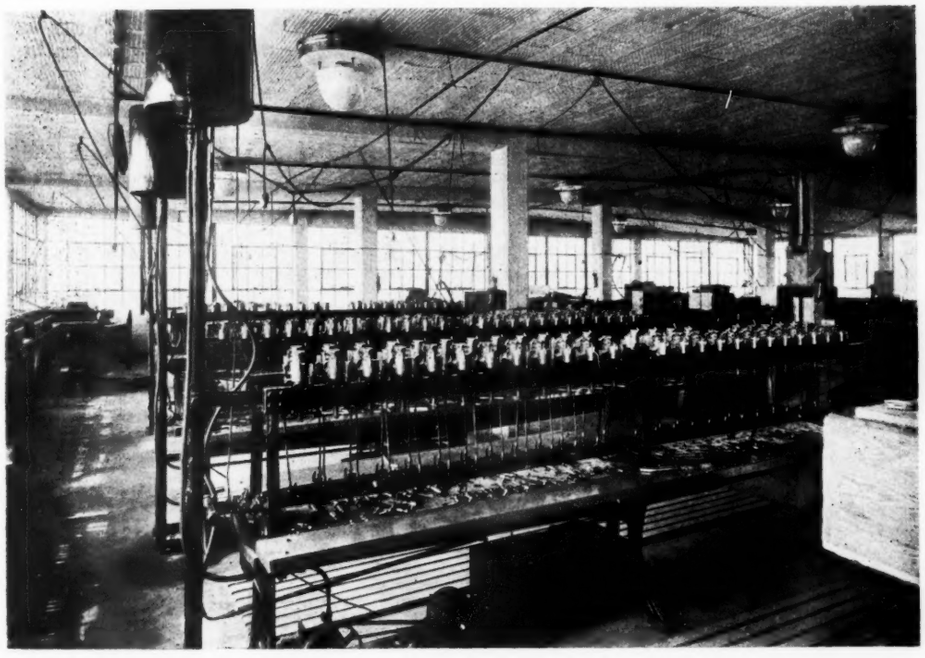
In order to maintain alignment on a Zenith carbureter drilling of the jet passages and other essential points is carried on at the same time by this special machine, which drills from three directions at once

it can be drilled again for the size originally intended. It would be impossible to obtain this same accuracy in these small openings with any sort of gage, and at the same time, while a gage would have the human element to disturb accuracy, the mechanical clockwork arrangement gives a definite time not subject to the variations of eye and hand.

Jeweler's Machinery Used

The operation of putting the points on the float-feed needle valve is done with a jeweler's lathe, and the operator examines his work through a jeweler's eyepiece. This operation is shown in the accompanying illustration. The needle valves are made of Monel metal, and they are first rough pointed.

For airplane carbureters it is necessary to go to these lengths to obtain the required results, and the same standard is maintained for other parts of the airplane carbureter. The bodies, which are of aluminum composition, must be hand-scraped and burnished all over, in order to remove all the flaky skin of the aluminum, to make sure there is no possibility of a flake entering the jet of the carbureter and stopping the flow of gasoline at some critical moment. The percentage of casting loss is tremendously high, due to the fact that the scraping off of the skin of the casting will often disclose small sand or blow holes. This gives a very costly production, from the manufacturing standpoint, but when it is realized how important small details can be in work of this kind it is necessary to go through considerable expense in the manufacturing end. Some of the special types of machines adapted for carbureter manufacture are of interest, as they differ from other lines of work in a great many details because of the small size of the parts worked upon. One of the interesting machines at the Zenith plant is the three-way drill shown herewith. This method of handling the work is necessary because of the difficulty in obtaining alignment by any other means. It will be noted that the drills go in from both sides and from the end at the same time.



Float testing racks providing for a twenty-minute gasoline float level test of over a thousand carbureters a day. The gasoline is caught in a tank below and automatically pumped to the constant level supply tank above the racks—one of the steps in the complete test given every Zenith before shipping

As an indication of the growth of the use in internal-combustion engines, and also the rate of production of the Zenith Carbureter Co., the following table of production is expressive:

PRODUCTION BY YEARS

Year	Carbureters
1913	25,000
1914	34,300
1915	64,000
1916	115,000
1917	210,000

Willard Develops New Separator

Made of Rubber Composition with a Multitude of Threads in It

AFTER a period of experimenting and testing extending over three years, the Willard Storage Battery Co. of Cleveland has developed a new storage battery featuring a rubber-thread insulator or plate separator. It is the function of the insulators to separate the battery plates and to hold the active material of the positive plate from contact with the negative plate. Contact between these plates causes a short circuit which quickly destroys the battery. Yet, while holding the plates apart, these insulators must be porous to permit the circulation of the electrolyte.

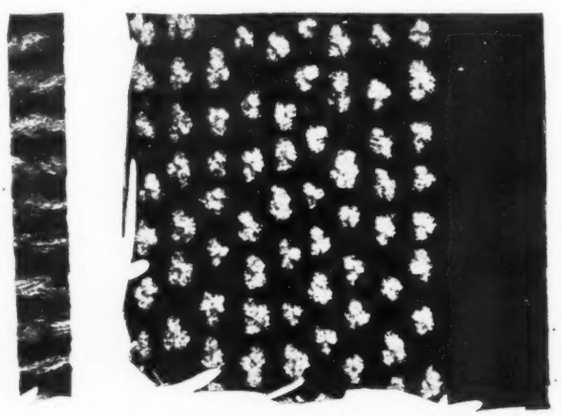
In the new Willard battery this is effected by the use of rubber composition insulators, each pierced by 196,000 threads 1/32 in. long, and of a diameter so small as to be almost invisible to the naked eye. The battery solution is drawn through these threads by capillary attraction, and offers a free passage to the electric current, though the insulators present a solid face to the active material.

Because of the fact that rubber offered an ideal insulating material many experiments have been made in the past. Punching holes in the rubber was not entirely satisfactory, because if the holes were small, the electrical resistance was considerable, whereas if the holes were large, small particles of the active material bridged the gap and short circuited the plates. By closing these holes with thread, the difficulty was eliminated.

The problem of manufacturing these insulators economically was as great as that of designing the separator. Special machines have been designed, however, that make it possible to produce the new battery at from $3 to $7 more than a battery using the former wood insulator.

A representative of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES saw a set of the rubber-thread insulators taken from a battery that had been in service nearly two years. In spite of the fact that the plates indicated that the battery had been run with too little electrolyte, the insulators were in good condition, and could doubtless be used again. The active material of the plates had been held in place, and the insulators showed but slight brittleness.

It is not expected that the new insulator will render the battery indestructible—as that is obviously impossible, nor that it will permit neglect of the battery by the owner. The same rules of flushing and proper charging must be observed. However, the new plates tend to increase the capacity of the battery to stand abuse and to lengthen its useful life.



Micrographs of the new Willard separator

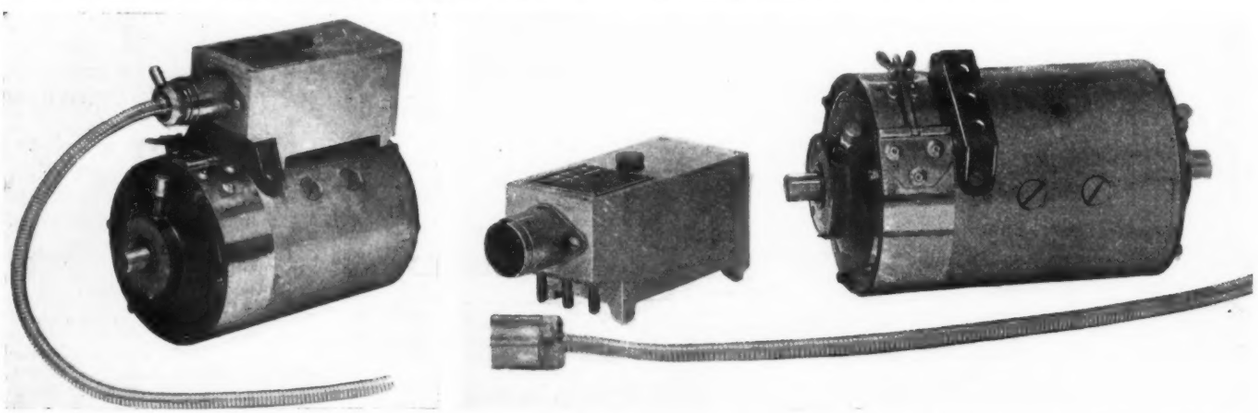
Bijur Generator for Military Trucks

THE War Department specifications for military motor trucks express the preference for electric generators with voltage regulation. The basic idea of this is that it renders the generator independent of the battery.

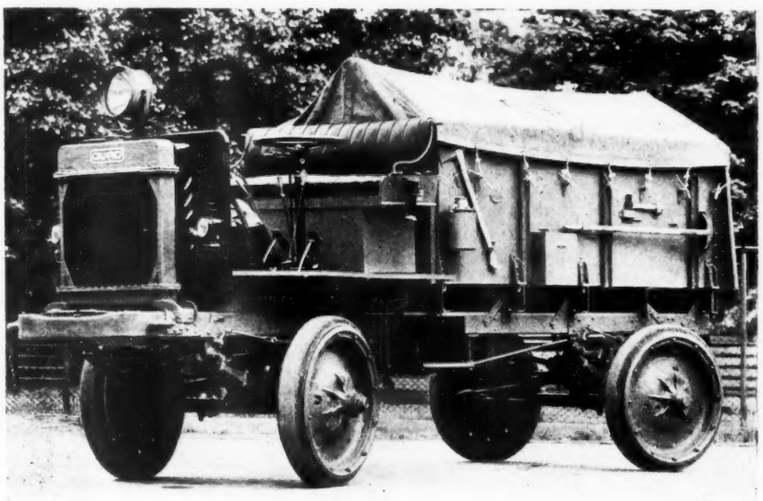
The Bijur Motor Lighting Co. of Hoboken, N. J., had a design of generator which complied with the government requirements almost exactly, this being a type used on Packard and Jeffery trucks on the Mexican border last year. The regulator box which contains the vibrator of the patented Bijur type is mounted on top of the generator, being attached by a single screw with a knurled head. Electrical connections to the generator windings are made by three brass split pins in the bottom of the regulator case which plug into the terminal block on the generator so the regulator can be detached by undoing only one screw and a new unit can be substituted in a few seconds. The generator is connected to the battery by a disconnecting plug which sockets into the regulator case.

The generator is set to commence charging the battery to 450 r.p.m. when it is delivering 6.5 volts. At high speeds the voltage rises to 7.8 volts and is then constant for current outputs of from 1 amp. to 12 amp.

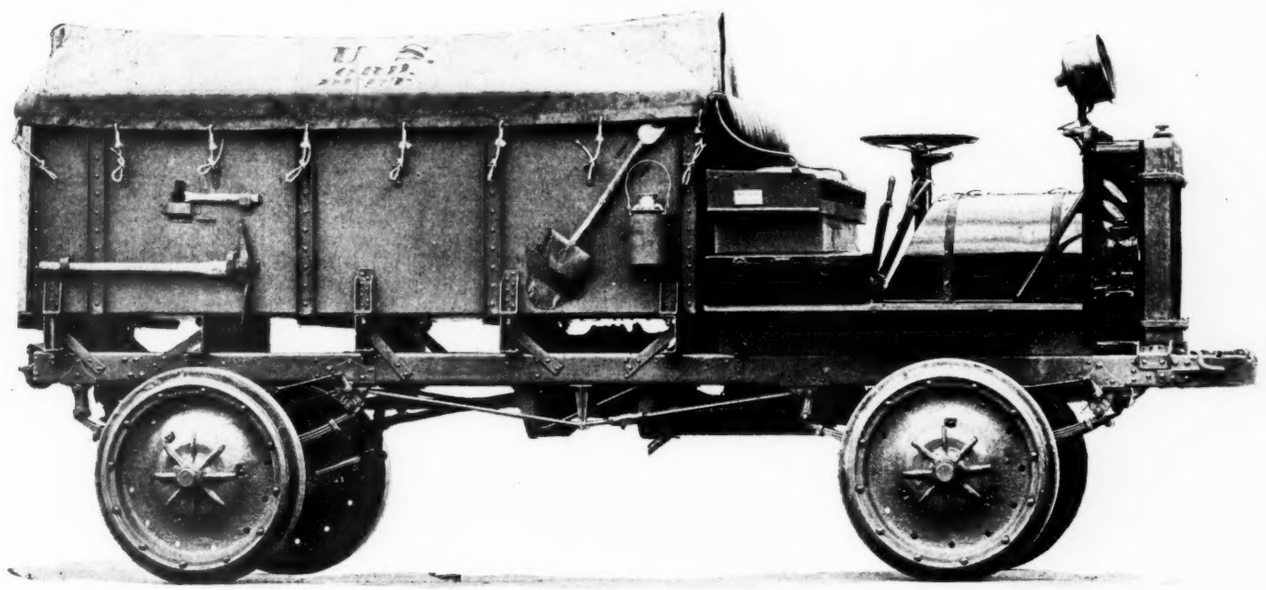
The weight of the generator with the regulator is 23¾ lb., and it can be provided either with a through drive, the armature shaft projecting at each end, or with one closed end. The usual method for attaching it is by means of a magneto type strap holding it down on a base.



At the left is shown the Bijur lighting generator, with regulator box mounted on magnet casing. At the right is illustrated the apparatus disassembled, showing how the connection is made by three plugs



Standard Ordnance Truck Body, Drawings and Complete Specifications of Which Were Published in The Automobile and Automotive Industries August 30



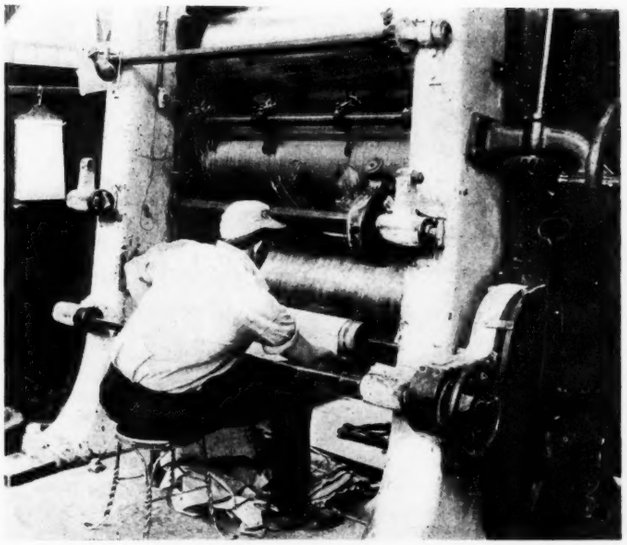
Accidents Reduced in Republic Rubber Plant

THE Republic Rubber Co. at Youngstown, Ohio, increased its working force 100 per cent in 8 months, and despite the large number of unskilled, strange employees, enjoyed the lowest accident hazard figures in the State. In 1915 the company reduced its accidents by more than 60 per cent and entirely eliminated "lost time" accidents. It has discovered an unpleasant but very effective means for eliminating to a large degree that bane of every factory, industrial mishaps to the workers.

When an accident occurs in the Republic plant, the safety-first supervisor, who is also an expert photographer, hastens to the scene with the camera. A photograph is taken of the accident showing how it happened and the result, and this is posted both for education and for warning purposes, in plain view, so that all employees can see it.

The photograph is more effective than a written warning. All cannot read, but all can see. The scheme has proved its worth, and is probably one of the most valuable that has yet been tried for the purpose of eliminating factory accidents.

In addition to this plan, the company adopts numerous others calculated to efficiently save the employees. All mechanical apparatus is safeguarded in every possible manner. Signs, prominently displayed, call attention to the different dangers. Fire-boxes are to be found in every section of the plant, and signs, with wooden finger pointers, indicate the whereabouts of the alarm box.



A bar placed before this calender keeps the worker at a distance so that he does not place his hands in a dangerous position

The FORUM

Dust Collectors Needed in Dry Sections

By Arthur Wilson

IN THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES for July 19, the question is raised as to whether the conditions surrounding the operation of a tractor are much worse than those met with in driving an automobile over some roads. Two instances recently came to my notice, which prove to some extent that dust collectors are a necessity, especially in California, where the ground is very dry.

One tractor was equipped with a dust collector using water. It has the breather connected to the dust collector. The owner of the machine neglected to keep the collector filled. In a very short time the engine lost compression and finally stopped. On tearing the motor down it was found that the pistons, rings and bearings were considerably worn. All other tractors in the same service are giving excellent service. But the operators clean and refill the dust collector with water each day. A really surprising amount of mud is taken out, about ½ in. in the bottom of a 6-in. pan.

The other tractor has a motor of high grade with force feed oiling through a drilled crankshaft. The tractor operated on an orange ranch in very sandy country using a centrifugal dust collector. After running a reasonable time it was overhauled, cylinders and crankshaft reground, new pistons and rings fitted. During the first week after overhauling it was operated without the dust collector; then the collector was put on. The engine operated another week, after which it was completely worn out. It was brought in for overhauling and torn down. The pistons were very loose in the cylinders. The rings and ring grooves were worn until the rings lacked 1/16 in. of filling the grooves. The ends of the rings were worn so thin that in some cases they had broken off. The connecting-rod bearings plainly showed the grinding action of the sand, and would have pounded out had it not been for the bronze backing of the babbitt. The main bearings were also loose. In the bottom of the crankcase was an oily silt; this when rubbed between the fingers felt like a fine sand. The engine was again overhauled and has now been in service about 4 weeks, but with the dust collector attached and the breather protected.

Automobiles, coming in from the desert, often have a layer of sand over all the working parts. This sand is as fine as flour. Surely the sand must get into the crankcase through the breather and into the combustion chamber through the carbureter, as no means is taken to prevent its entrance. The only difference between the two services is the difference between the loads carried by the tractor engine and the automobile engine. This may in part explain the long life of the automobile engine and the short life of the tractor engine unprotected by a dust collector as given in the above instances.

Advocates Superheated Gas

By W. P. Deppe

A. C. BEDFORD'S recent warning to the nation that passenger car owners must forego joy riding so as to curtail the use of gasoline is very pertinent, on account of the present crisis. But you cannot ask these owners to stop the use of gasoline any more than you ask them to stop the increased use of telephones, or the use of more water, etc.

I have been talking of the use of superheated gas methods for using a mixture of present gasoline diluted with equal amounts of kerosene, which will permit of doubling the so-called gasolines over night. But that sort of a mixture will make the present wet-mixture carbureter-equipped engines practically useless.

Already existing engines are being ruined by the dilution of lubricating oils with the kerosenes now being used to increase the volume of gasoline, so-called, sold to the public.

The automobile makers will not investigate the possibilities of superheated gas methods. It will cost some money to alter engines slightly to fit dry gas mixtures. But the total cost of producing an engine outfit is considerably less with dry gas methods than with wet mixture methods, and that is what counts.

The oil men feel that car makers should provide the proper kind of gas machines. The car makers, on the other hand, say that the oil men should find more crudes and make better gasolines.

The public wants more gas engines that will burn much less volatile oils as fuels. There must be an improvement in gas engine operation over the four-cycle method of Beau de Roche in 1862. That is the use of superheated dry gas fuel mixtures, instead of allowing liquid oils to pass into the cylinders as is now universal practice, which method has not kept pace with the falling volatility of fuel oils sold as gasoline.

The use of dry gases as a fixed mixture will permit of using smaller engines in point of number of cylinders, thus reducing manufacturing and upkeep costs, and engines must be built to-day with regard to fuels rather than fuels made for any special type of engine.

If my methods could be used, or others like it, it would mean that oil men could produce gasoline from two-thirds of all crudes, instead of but 18 per cent as now, which is ruining engines by going into cylinders raw, and diluting lubricating oils.

Balancing Six-Cylinder Shafts

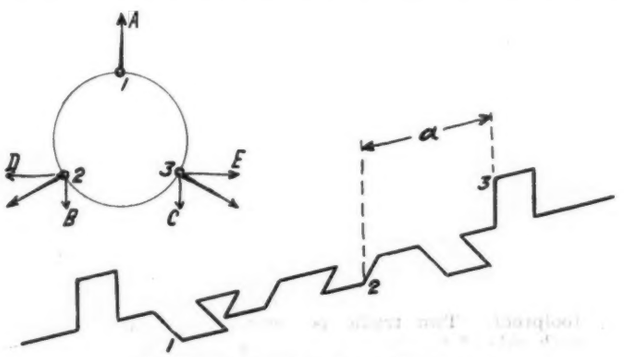
By N. W. Akimoff

I WISH to correct the erroneous idea, apparently being now circulated by some of the home-made balancing "experts" relative to the practice of balancing six-cylinder shafts.

As clearly stated in my original paper on the subject, presented at the New Orleans convention of the American Society of Mechanical Engineers, the correct way to secure such balance implies drilling the flange, for the simple reason that drilling the three cheeks at 120 deg. apart cannot very well give good results.

To illustrate: It *looks* as though correct balance can be secured by drilling, say, as illustrated at 1, 2 and 3. But the fact should not be overlooked that drilling at 2 and 3 introduces, in addition to useful components, *B* and *C*, also two *unbalancing* components, *D* and *E*, which, acting on such leverage as *a*, tend to knock the shaft out of balance again.

While, in practice, such faulty methods *might* lead to what may be called *near-balance*, especially if the shaft is *not* of the seven-bearing type, at the same time to preach such



Analysis of balancing six-cylinder shaft

methods as being anywhere near correct in *principle* is evidence of extreme ignorance on the part of the preacher, unless it is deliberate desire to discredit the art.

Let, therefore, every self-respecting engineer ponder over this simple point, so as to avoid the very possibility of contact with some quack that may come up and advocate it as scientific method.

Suggests Changes in Boulevard Plan

By Ambrose Ryder

Superintendent of the Automobile Dept. of the National Workmen's Compensation Service Bureau

I WOULD like to add a few suggestions to the plans outlined in the May 24 issue of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES, "The Automobile Road Revised." From a safety point of view the plan shown in the upper left-hand diagram of page 1001 is a poor one. The lighting would be rather bad underneath the bridges and the views would be obstructed. Cars would have sharp turns to make at the bottom and pedestrians would be placed in considerable danger. The diagram at the bottom of page 1001 seems to offer the best all-around possibilities.

There are good arguments for and against the division of the wide boulevard into three or four separate roads. As long as the traffic is light or reasonably evenly divided as to the two directions and also as between the fast and slow, this division is warranted. Otherwise the boulevard will need to be wider, because of the inflexibility, than without the dividing rails (to handle the same traffic with the same speed) and I doubt very much if the sum total accident hazard will be reduced. It would be well to divide only a portion of the boulevard and test the merits of either plan. At any rate, the fast-going vehicles planning to leave the boulevard should be permitted ample space in which to work over among the slow-going automobiles before making the curve to the right. Your diagram shows the fast-going vehicles making a short curve to the right directly across the path of the slow-moving ones.

Fig. 1 is a rough sketch of the lower portion of this diagram. Consider for a moment the hazards to a pedestrian going North on the East side as shown by the lines of traffic. He must first look back over the left shoulder for the automobiles speeding up to make the grade, then to the right for the ones coming down, then again to the left for those from the north rounding up the hill, and finally sharply to the right for those swinging down close to the inside curve. Conditions are just as bad for the pedestrian going South. These hazards can be avoided by tunneling the sidewalk as shown by the dotted lines.

There are also three dangerous traffic intersections. "West-South" traffic (from west to south) going down hill crosses the "North-East" traffic coming up, at an acute angle on a steep curved grade. A few feet later it crosses the "South-North" traffic at the foot of the grade. "North-East" traffic crosses this "South-North" traffic before winding up the hill to meet the "West-South" descending. Where the traffic on the underground cross-road is light, and where there is a clear view on both sides of the grade, the dangers would be considerably lessened and I doubt very much if it would be at all practical at this time and age to consider any improvement involving additional expense. But where this "North-South" road is an important highway, any plan for relieving this situation deserves serious attention.

Fig. 2 shows the "grade" traffic passing over the "South-North," thereby eliminating all of the above bad features with one exception. The "West-South" still crosses the "North-East" but at a lighter grade. This plan permits a gradual descent, with the confiscation of less land at the corner. It would do away with the traffic policeman but would entail a heavier initial expense and the underground road would have to be fairly wide at this point.

Fig. 3 shows the ideal crossing at a further initial expense. The "West-South" traffic is taken care of by a separate grade running direct from the boulevard down to the west side of the road. It is hard to imagine a crossing that would be more foolproof. Two traffic policemen are eliminated (one on each side of the boulevard). The initial expense is not excessive and it even has considerable artistic possibilities. Street car lines can be handled very easily in either Fig. 2 or Fig. 3.

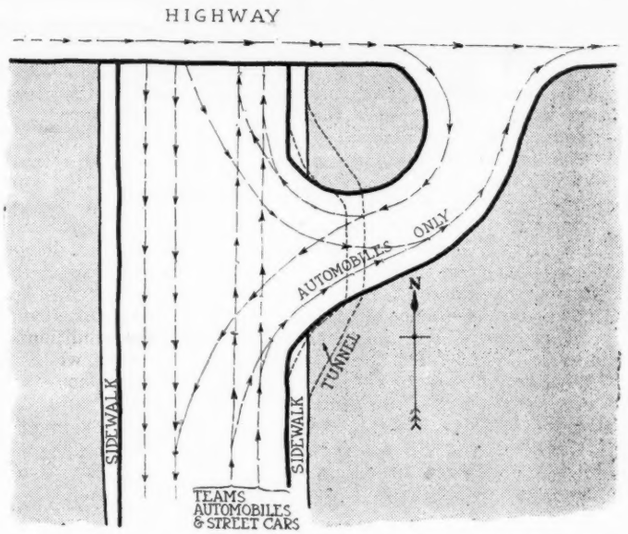


Fig. 1—Sketch illustrating dangerous traffic intersections on proposed automobile road

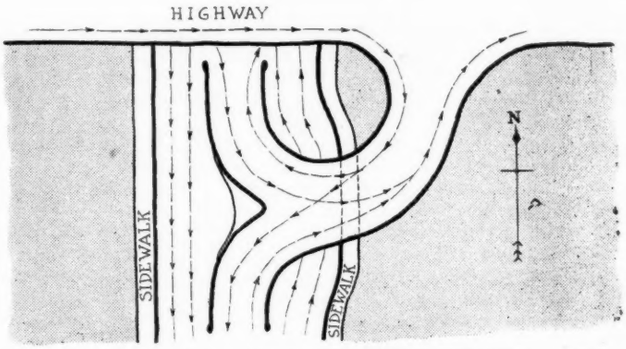


Fig. 2—Grade traffic passing over the South-North traffic. Note that West-South traffic still crosses the North-East but at a lighter grade

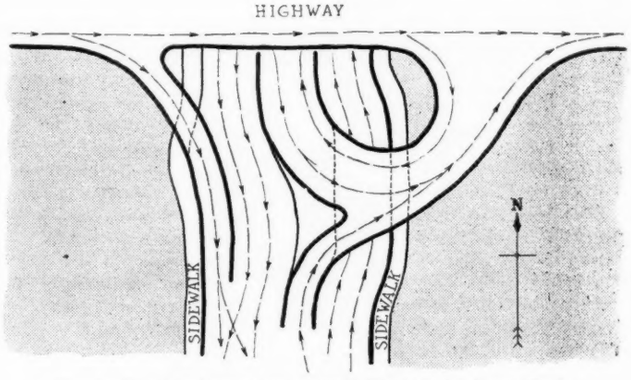


Fig. 3—The ideal crossing as suggested by Ambrose Ryder

The practical man at first feels that expensive remedies for chronic traffic conditions are not warranted. However, there is a recent tendency in motor transportation that proves fair to become very popular. It may before long induce the states and counties to junk a great deal of the present highway system. I refer to the commercial trailer and the tractor with a train of trailers. It is the old question over again of the long freight train versus the two or three short ones. Good roads are the needed stimulant.

It does not take much imagination to picture the street-crossing congestion that would result in a few years under

our present system, with twice as many passenger cars and ten times as many commercial cars. Then add a trailer to 50 per cent of these trucks and as many more trains of trailers as the present number of commercial vehicles, and the crossings that are unpopular to the pedestrian to-day will be "no-man's land" to-morrow.

The building of these intercity boulevards with "foolproof" crossings should be pushed strenuously, along with the general scheme for good country roads. But there is another problem that should be handled simultaneously. Most of the cities already have their "traffic problems" and these boulevards and good roads will only tend to aggravate the situation by dumping more vehicles into the cities. A few streets can be widened, some new ones can be built, overhead crossings will be considered, and regulations will be made and better enforced; but I think we should look to the one-way street for the greatest relief.

A discussion of the merits or demerits of the universal adoption of the one-way street system does not belong with this article. I would appreciate your views as to the advisability of a general discussion of this subject in THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES.

All-Around Tractor Requirements

By George H. Gibson

Geo. H. Gibson Co., Consulting Engineers

THE great success achieved by Ford and his organization in other lines makes one hesitate to criticize the new Ford tractor, described by J. E. Schipper in THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES for Aug. 2. However, there may be no harm in pointing out some respects in which this design appears to fall short, and also undoubtedly there is room here, as elsewhere, for a number of types to meet different ideas and conditions.

To be sold in great numbers, a tractor should meet the requirements of the average American farmer, who does more or less general farming on a medium or small-sized farm. Now, in order to save much money for such a farmer, the tractor should be able to do quite a number of things, such as mowing, harvesting, tedding, loading and unloading and driving power machinery, such as silage shredders, grain grinders, buzz saws, etc. If the load factor can be doubled, that is, if the tractor can be kept in profitable operation twice as many days in the year, it will save more money.

The largest item of cost in farm operation is labor, and in the busy season extra men are often unobtainable at any price. A tractor, therefore, which requires two men for such simple operations as plowing, mowing or harvesting, cannot be regarded as a complete and final solution of the farm tractor problem, since a man watching the operation of a harvester, for example, still has plenty of energy and attention left to guide and control the motor. That the one-man drive is not impossible or even difficult of realization is indicated, of course, by the large number of tractors to which it has already been applied.

Again, is it good engineering to transmit power for the operation of machinery, such as harvesters and mowers, hauled behind the tractor, through the medium of tractor wheels, with the accompanying power loss and difficulties of operation, especially on rough or slippery ground? Why not send the power directly from the motor to the machine, as by flexible shafting? Of course this couldn't be done with the horse; he wasn't built that way, which explains why master drive wheels and speeding up gears were developed for such machinery, but there is no reason for retaining it where an engine furnishes the motive power. The mere saving in cost of traction wheels and gears would amply cover the cost of the direct transmission parts.

In the case of mowers, it would even be possible to arrange an attachment so that the mowing bar could be suspended directly from the tractor frame. Harvesters would require little modification in design further than the substitution of a plain wheel for the present master wheel and leaving off the bevel and spur gears, etc. It ought not to be difficult for a tractor builder to "hitch up" with some manufacturer of harvesters in this manner.

There are some theoretical advantages likewise in carrying plows directly from the tractor frame; the pressure of the plow against the bottom of the furrow is thus relieved and added weight put upon the tractor wheels, thus gaining better adhesion. This idea has been used to some extent in England, with what success I do not know.

Other Applications

An all-around farm motor could also have a pulley and possibly also a winding drum, the latter for such purposes as unloading hay wagons and operating scrapers, the latter of which could be used with great efficiency in getting manure out of barnyards, for example.

These changes and attachments would involve some increase in the cost of the tractor, but not so great, I believe, as the increase in utility, provided of course that a line of agricultural machinery were properly co-ordinated to work with the all-around tractor.

—

Properties of Carbon-Vanadium Steels

THE table below gives the properties of different carbon vanadium forging steels, both in the rolled state and after various heat treatments. It is taken from a paper contributed by G. L. Norris to the proceedings of the American Society for Testing Materials.

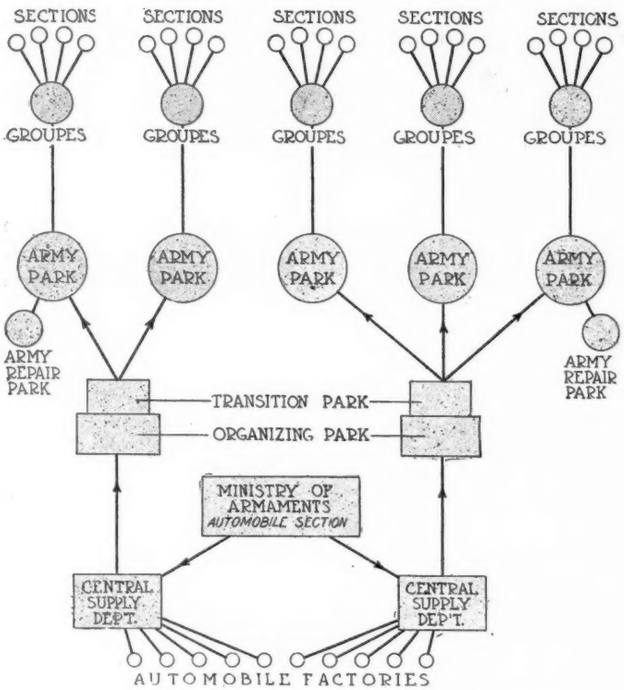
TABLE OF PHYSICAL PROPERTIES OF CARBON-VANADIUM FORGING STEEL

Chemical Composition Per Cent	Kind of Specimen	Treatment	Elastic Limit, Lb. Per Sq. In.	Tensile Strength, Lb. Per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent
C. 0.34 Mn. 0.87 V. 0.13	1¼-in. round bar	As rolled	78,000	102,000	23	51
		Annealed 890° C.	65,000	86,000	28	63
		Oil Q. and T., 900/600° C.	90,000	118,000	25	61
		Oil Q. and T., 875/600° C.	85,000	102,500	22	57
		Water Q. and T., 875/600° C.	93,000	110,000	24	57
		Water Q. and T., 845/565° C.	100,000	125,000	19	60
		Water Q. and T., 845/540° C.	110,500	130,000	19	58
		Water Q. and T., 845/510° C.	115,000	133,350	19	58
		Water Q. and T., 845/455° C.	118,500	145,000	15	51
		Water Q. and T., 845/400° C.	132,500	160,000	12	40
C. 0.37 Mn. 0.96 V. 0.13	1-in. round bar	As rolled	75,000	102,000	23	57
		Annealed 890° C. in air	70,000	90,000	28	63
		Oil Q. and T., 900/650° C.	90,000	114,000	22	64
		Oil and Q. T., 900/610° C.	92,000	118,500	21	63
		Oil Q. and T., 900/540° C.	98,000	120,500	22	62
		Water Q. and T., 830/650° C.	85,000	102,000	26	68
		Water Q. and T., 830/600° C.	97,000	115,000	23	65
		Water Q. and T., 830/540° C.	100,000	120,000	23	67
C. 0.37 Mn. 0.96 V. 0.13	3¼-in. hub, outside[1]	Oil Q. and T., 900/595° C.	92,000	119,000	20	55
	3¼-in. hub, center[1]	Oil Q. and T., 900/595° C.	87,000	116,000	20	52
	2¼-in. pin, center[1]	Oil Q. and T., 900/595° C.	95,000	121,000	18	52
C. 0.47 Mn. 0.90 V. 0.15	1½-in. round bar	As rolled	98,000	135,000	16	39
		Annealed 790° C.	70,000	108,000	21	51
		Annealed 790° C.	70,000	107,000	22	53
		Annealed 830° C.	75,000	107,500	21	48
		Oil Q. and T., 900/700° C.	95,000	120,000	22	61
		Oil Q. and T., 900/650° C.	97,000	125,000	21	60
		Oil Q. and T., 900/600° C.	100,000	128,000	21	58
		Oil Q. and T., 875/430° C.	117,000	137,000	19	52
		Oil Q. and T., 875/315° C.	112,000	139,000	18	51
		Oil Q. and T., 875/200° C.	115,000	142,500	17	45
		Water Q. and T., 830/595° C.	122,000	136,000	20	57
		Water Q. and T., 830/540° C.	130,000	144,000	19	55
		Water Q. and T., 830/430° C.	150,000	172,000	15	44
		Water Q. and T., 830/315° C.	140,000	171,000	11	30
C. 0.47 Mn. 0.90 V. 0.15	7-in. axle	As forged	68,000	123,000	16	30
		Annealed 790° C.	52,000	90,000	24	50
		Oil Q. and T., 870/625° C.	82,000	112,500	22	55
C. 0.47 Mn. 0.90 V. 0.15	11-in. axle	As forged	70,000	117,000	16	28
		Annealed 790° C.	54,000	94,000	22	47
		Oil Q. and T., 870/625° C.	80,000	115,000	20	52
C. 0.47 Mn. 0.90 V. 0.15	Connecting rod	As forged	85,000	131,000	17	44
		Annealed 790° C.	67,000	105,000	23	52
		Oil Q. and T., 870/625° C.	86,000	123,000	20	50
C. 0.47 Mn. 0.90 V. 0.15	11-in. axle, bored with 5-in. hole	Annealed 880° C. in air	63,000	97,000	24	52
		Annealed 880° C. in air	64,000	99,500	23	51
		Annealed 880° C. in air	65,000	100,000	23	52

[1] Specimen from aeroplane engine crank shaft forged from 4 by 4-in. billet cut from 4 by 16-in. slab.

French System of Truck Supply

Delivery from Manufacturer to Civil Department, Thence to Military Headquarters, Finally to Point of Use



Diagrammatic outline of the French system of motor truck supply, showing the organization which has been built up between the factories producing the vehicles and the units in the field that make use of them. The system includes two Central Supply Departments, one being in the neighborhood of Paris and the other in the Lyons district

BETWEEN the factory which produces automobiles and the units which make use of them in the field it has been necessary to build up an organization which at first sight looks complicated. Cleared of many of its details, such an organization is shown in the accompanying diagram. Orders for automobile material come from the Automobile Section of the Ministry of Armaments, which acts through the Central Supply Departments. There are only two of these departments in France, one being in the neighborhood of Paris and another in the Lyons district. Acting on instructions from the Ministry, the Central Supply Departments place the contracts with the factories and take delivery of the goods. The detailed work of this department, which has been described in previous issues of THE AUTOMOBILE, is more elaborate than would appear at first sight. Trucks are not always received complete, but in chassis form, or lacking many of the necessaries for war service. The Central Supply Department equips them either in its own shops or in controlled establishments, and distributes them to an organization in the field. Methods of delivery from the factory to the supply department have to be considered. When the two are in the same town the task is easy. But in the case of Fiat, for instance, which has its factory in Turin, Italy, and has to deliver over the Alps to a town in France, a special organization becomes necessary. Every day the Fiat factory forms a convoy of thirty to forty trucks and sends these out in charge of factory testers—one man per truck—to a frontier town 6000 feet above sea level. Here French soldiers are waiting to drive the trucks direct to the Central Supply Department, a distance of about 150 miles. Many of the trucks are not fitted with bodies, the French preferring to do this work themselves. Thus a rough wood box to carry a load of sand is fitted, and the driver has a very light airplane seat. On reaching their destination the airplane seats are dismounted by unscrewing four bolts and handed over to a transportation agent, who returns them in lots to the factory. The boxes are not of sufficient value to be returned. This method of delivery is quicker than rail. Although there is an examination and test at the Fiat factory, the trip by road eliminates any necessity for a test at the Central Supply Department, for the total run is more than 200 miles, all over mountain roads. When the factory and the supply department are in the same town, there must be a special road test before a truck can be sent to the front.

Under Control of Ministry

Leaving the Central Supply Department fully equipped for war service and manned by army trained drivers, the trucks move up to an organizing park. All the organizations mentioned up to this point are under the control of the Ministry, and not of the army. On the next stage they pass into a Transition Park, attached to the Organizing Park, but, unlike the latter, are under army control. The Transition Park distributes the trucks to the army parks to which they will remain permanently attached so long as they are in the field. The army divisions are groupement, groupe, and finally sections of fifteen to twenty trucks which generally work together under the control of a lieutenant.

—

A New Tool Steel Announced

WORD comes from England of the discovery of a new tool steel which is said to be the equal in durability and hardness to high-speed steel, although it contains no tungsten. The new steel is known as Cobaltcrom and is the product of Darwin & Milner of Sheffield. About a year ago the head of this firm discovered that by adding cobalt to chromium-carbon steel he obtained a steel which had the very valuable property of red-cutting hardness.

Hardening Presents a Problem

It is estimated by Darwin & Milner that while at the present time nine-tenths of all turning tools are made from tungsten steel, this latter steel is as yet little used for milling cutters, taps and reamers. The reason is said to lie in the difficulty which tool makers experience in hardening such tools, having fine edges, at the high heat required to secure from tungsten high speed steel its best cutting efficiency. This steel requires hardening at from 1250-1350 deg. C. for best results. The maximum heat necessary for hardening Cobaltcrom steel is 1000 deg. C. Heating to a higher temperature is said to affect the steel detrimentally. Hardening in practically all applications is stated to be satisfactory when the tool is allowed to cool in still air free from drafts and currents, whereas with the tungsten high speed steel hardening from the extreme high heat renders it necessary to quench either with a strong air blast or a sudden immersion in liquid.—*Engineering*, July 6.

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Airplane Production Cost

THERE has been an outcry in the newspapers recently against alleged extortion practised against the Government by the manufacturers of airplanes. It is not our intention here to discuss the merits of the case, but merely to point out a few pertinent facts which are apt to be lost sight of in considering it.

Experimentation in airplane work is a very costly undertaking. Those who engage in it risk not only their capital but in many cases their life. Up to quite recently there was practically no market for airplanes, if we neglect the few that were sold for instruction and exhibition purposes. In fact, even to-day practically the only outlet in sight is to the Government for war purposes.

Those who have developed the airplane industry in America to its present stage have done so in the hope that eventually they would be repaid for their trouble and risks. They passed through the same period of hardships and disappointments as pioneers in many other lines of industrial development. The inventor of an ordinary mechanical device looks to the general public, whom his device is to serve, for his reward. Practically every airplane inventor realized from the beginning that the greatest field for the application of aircraft would be in military work and that his reward, if any, must come from the Government. The airplane business is a hazardous one, not only to those who engage in it with a view to become pilots, but also those who invest their capital in it, and it would not be fair to ask these men to forego reasonable profits on grounds of patriotism.

The taking over by the Government of the development of airplane engines should result in a material reduction in the cost of this development. It will cut out much duplication of effort, and therefore eliminate much waste. With some of the most successful engineers in this line of work in the country in charge, success is certain, and once the designs have been finally approved and the production schedule settled, steps can be taken to lay down plants for the production of the engines in the most economical way possible in view of the numbers required.

It appears that contracts for these engines are to be given out on a "cost plus" basis. This will eliminate the chance of making excessive profits at the expense of the Government, but will, it seems, also eliminate all incentives to cost reduction other than patriotism. Whether this plan will work out to satisfaction remains to be seen.

Valve Operation Losses

A QUESTION has been raised as to the amount of power required to operate the camshaft of an ordinary poppet valve engine. It is of interest in comparisons of the poppet valve engine with other types. Experimentally the problem can be solved only for a single engine at a time; that is to say, an experiment made to determine the power absorbed in driving the camshaft of a certain engine would settle the question only for that engine. Moreover, the experiment is rather difficult to carry out with any degree of accuracy.

The camshaft is usually driven directly from the crankshaft and it is practically impossible to insert a transmission dynamometer in the drive. Driving the camshaft from a separate source of power will not give absolutely correct results, as if the crankshaft is stationary the exhaust valves do not have to be lifted against gaseous pressure in the cylinders. This, however, can occasion only trifling losses, for as soon as the valve head is off its seat the pressure will be equalized above and below it. The chief source of loss is the friction at the cam surface, the pressure against which results from the pressure of the valve spring and the inertia of the valve parts. This pressure really exists only during the lifting period of the valve, as during the closing period spring pressure and inertia force are opposite and at least nearly neutralize each other. In case the valve is held fully open for any length of time only the spring pressure is active in causing friction on the cam surface. In addition to the friction on the cam surface there is the friction in the camshaft bearings, to which the pressure on the cam surfaces is transmitted. Also, the loss in the camshaft gearing should be included if it is desired to determine the power loss caused by valve operation.

A method of determining this loss approximately

would be to drive the camshaft by a calibrated electric motor through a flexible shaft or flexible coupling. A slightly more accurate method would be to drive the camshaft from the electric motor through a 2:1 gear, as this would take account of the gear loss.

An absolutely unobjectionable method is described by Dr. Riedler in his book on "The Scientific Determination of the Merits of Automobiles." He mounts the gear free on the camshaft and provides it with a lug located between two stops on a bracket on the camshaft. He then drives the camshaft by means of an electric motor and by means of electrical contacts on the camshaft gear and the bracket respectively, which are connected in circuit with a source of current and an indicating device, is able to apply just sufficient current to the motor to supply the power required for driving the camshaft and no more.

Tractors Need Housing

ONE of the strange sights often seen in agricultural districts is such machinery as self-binders standing out in the open field or in the farmyard late in the fall or even in winter, months after the period of their use has passed. This sort of treatment seems to be accorded agricultural machinery more often in the poorer sections of the country than in those sections where the buildings, fences, etc., show farming to be in a prosperous condition. The reason for this neglect probably is that there is no building available for sheltering the machine and that the investment necessary for a shed to house it is considered unwarranted. In some instances machines are stored during the winter months in buildings which are used for other purposes until late in the season.

Machinery subject to such neglect will depreciate rapidly and be short lived. In order to keep down the actual loss due to depreciation it must be built cheaply. This condition has confronted tractor designers, and the question with many of them has been whether, in view of the neglect that will be the part of most of the tractors, it is advisable to introduce certain refinements of construction which would render the machine more efficient and reduce its wear from natural causes. A highly developed piece of mechanism demands proper care. It must not be overloaded, its lubrication must be carefully attended to, adjustments must be made promptly when needed and it must be protected from the elements during periods of non-use.

Fortunately the tractor can be put to one use or another nearly the whole year round, hence it will not be put aside and forgotten like some other highly specialized agricultural machines. Perhaps the first essential to the proper care of the tractor is a garage which completely protects it from the weather and which is sufficiently roomy to enable a man to do repair work in it conveniently. Besides being roomy the garage should have plenty of light, as it is mainly on rainy and overcast days that the farmer finds time to look after his machines.

Chain Track Vehicles

A RECENT review of the subject in one of the oldest mechanical papers in the world, *The Engineer* of London, points out that the idea of a system which would enable a vehicle to lay a track in front of itself continuously is nearly 130 years old. The review goes very briefly over the ground, pointing out that there are many different methods by which the result can be attained.

For the great bulk of tractor work there is little doubt but that wheels are satisfactory both for driving and weight carrying, but for many special purposes the wheel is useless. Just where the dividing line comes depends upon a variety of circumstances, but if there is any pronounced tendency at all just now, it is for the track layer to gain in competition with the wheel, rather than the other way about.

The tractor engineer is usually inclined to believe that the wheel will win out for most agricultural purposes, but the little information that trickles through from men who are having large scale experience of chain tread tractors on the European battlefields suggests that this type of drive is capable of very great detail improvement.

It is too early yet to pronounce judgment upon either the chain type of track machine or upon other systems which eliminate the wheel from ground driving contact. Simplicity certainly favors the wheel, but it is within the bounds of possibility that a track-laying type may appear whose efficiency more than counterbalances the wheel's chief advantage. Probably we shall know much more about it when the records of the war are all available.

Distillate

WE have heard a good deal in the East of distillate being used in motor trucks and tractors in California, and lately, it seems, many passenger cars also have been adapted for its use. The term "distillate" has been somewhat confusing. Ordinarily it is used to designate the residue left over when the process of distillation is completed. The California distillate fuel, however, is of a somewhat different character. It is a product of distillation like gasoline, but it is considerably heavier and less volatile than the standard gasoline, from which it differs also in being less clear and distinctly ill-smelling. No better definition of distillate can be given than that it is a product of petroleum distillation heavier than gasoline.

Although our modern cars leave the factory equipped to take care of a pretty low grade of fuel, most of them will not run on distillate without further heat supply to the air before it enters the carbureter and to the combustible charge after it leaves same. Besides, starting must usually be effected on gasoline. This involves complication, but in view of the fact that distillate retails at less than one-half the price of gasoline, owners are warranted in going to some trouble in adapting their cars to the use of this fuel—especially the owners who operate their cars for profit.

News of the Automotive Industries

Tire Price Rise Starts

Seven Leading Companies Announce Increases Ranging from 5 to 15 Per Cent

NEW YORK, Sept. 3—The long expected increase in tire prices has materialized with the announcement by seven companies of a rise of from 5 to 15 per cent in quotations. This is the third rise since last December and totals in all approximately 50 per cent. The last rise was in April, amounting to 15 per cent. Last December they rose 15 per cent. As in former rises, the mounting cost of production and the steady increase in fabric have been responsible for the higher tire prices. It has been stated that the fabric now going into one tire costs $4 more than it did several months ago. The prices of raw rubber are a trifle lower, so there is no cause for higher prices on that score, hence tubings are not so much affected.

The first to announce an increase was Goodrich which raised prices 10 per cent on all casings, tubes not being affected. Since then United States, Diamond, Fisk, Ajax, Goodyear and Firestone have made announcements. The first four of these have raised prices 10 per cent straight on all casings only. Goodyear pneumatics are 10 per cent higher while the solids are up 15 per cent, with no increase on tubes.

Firestone has raised its prices 10 per cent on pneumatic cords of triple tread; 5 per cent on FF non skid; 10 per cent on all fabrics; no changes on tubes.

Miller expects to raise prices about Sept. 15. No changes have been announced as yet by Kelly-Springfield, Lee, Globe, Pennsylvania, or Republic, but it is expected that these will soon follow the lead of the other companies.

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Establish Ball Bearing Bureau

WASHINGTON, D. C., Aug. 30—A group including the Fafnir, Gurney, Hess-Bright, New Departure, Norma, S.K.F., Standard Roller, and U. S. ball bearing companies have opened an office in the old Southern building and have combined to maintain a bureau, to be known as the Ball Bearing Manufacturers Engineering Bureau, where they will have two representatives who, in the combined opinion of all the manufacturers, are the most competent in their line. This has been done for the purpose of giving advice and information to the Government and making recommendations and layouts wherever bearings are involved.

The first two resolutions adopted by the organizers of the Bureau read as follows:

"That it is the sole purpose of the manufacturers combining to establish this bureau, to afford the U. S. Government a quick and easy means of obtaining technical advice and information which shall embody the best technical advice and experience of the combined ball-bearing manufacturers of the country.

"That no reputable ball bearing manufacturer who wishes to participate shall be excluded from the benefits of the bureau."

The representatives of the bureau will be J. H. Baninger and H. Wickland.

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M. & A. M. Sanctions Boston Show

NEW YORK, Sept. 4—The Motor and Accessory Manufacturers Assn. has sanctioned the Boston automobile and accessory show, March 2 to 9, 1918. The sanction places the exhibition on a par nationally with the New York and Chicago shows, as far as accessory firms are concerned. It now remains for the National Automobile Chamber of Commerce to place the show on an entire national footing when it will be wholly on a par with the other two national shows. This exhibition has been run independently of any M. & A. M. influence since 1913.

The Boston show has been acknowledged the best retail exhibition in the country and the location and time of the show have given it more of a national aspect than any of the other independent shows.

The accessory association will operate the show on the same basis as in New York and Chicago. Ten thousand feet of floorspace will be given over to its members in Mechanics Building and Machinery Hall, the rest of the space being apportioned to non-members. Chester I. Campbell will continue to manage the show as heretofore.

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NEW MARTIN AIRPLANE COMPANY

CLEVELAND, Sept. 1—Articles of incorporation will be filed in Columbus by the Glenn L. Martin Co. shortly, as the next step to establishing a large airplane factory in Cleveland. The personnel of the directorate of the new company includes William G. Mather, C. W. Bingham, Alva Bradley, S. Livingston Mather, Charles E. Thompson, C. N. Osborne and Glenn L. Martin. Mr. Thompson, president of the Steel Products Co., will be the president of the new company. Mr. Martin will be the vice-president and general manager.

300,000 Cars in Warring Europe

Entente Powers Using 170,000 and Central Powers 130,000 —U. S. Cars Not Included

WASHINGTON, Sept. 5—Three hundred thousand automobiles are now being used by both sides in the war, not including motor transports to be put in the field by the United States, according to a compilation just completed by the Japanese Government, which has been investigating the matter.

The principal Entente belligerents have approximately 170,000 automobiles in use, and the Central Powers 130,000. The automobiles in use by the Entente powers are distributed as follows:

England, 30,000, including 15,000 for the conveyance of supplies; France, 80,000, including 25,000 for carrying supplies; Russia, 40,000, including 20,000 for carrying supplies; Italy, 10,000, including 5000 for carrying supplies; Belgium, 10,300; Rumania, 1700; and Serbia, 125.

The numbers of automobiles used for war service by the Central Powers are: Germany, 100,000, including 25,000 for conveyance of supplies; Austria-Hungary, 30,000, including thirty for carrying goods; Turkey, 750, including fifty for conveying goods, and Bulgaria, 300.

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$1,000,000,000 More for Airplanes

WASHINGTON, Aug. 31—That the aviation campaign of the United States Government is yet in its infancy, and that the sum already appropriated by Congress for aviation purposes, and reaching $640,000,000, is to be more than duplicated whenever the proper authorities say the word, is vouched for by those in a position to know. The next aviation appropriation will total around $1,000,000,000, and even this sum will not be all should more be necessary.

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Detroit Section Meets Sept. 14

DETROIT, Sept. 1—The Detroit Section of the Society of Automotive Engineers will start to hold meetings again on Sept. 14. The organization now has a total membership of 1154, of which 795 are associates and 359 active. The section will make considerable attempt to increase membership this winter. Meetings this season will be unusually important because of the prominent part the S. A. E. is taking in war matters.

Car Sales Outlook Is Good

Detroit Plants Are Busy—Materials Shortage Continues—Shipping Difficulties

DETROIT, Sept. 4—Constant building activity among passenger car, truck and parts makers indicates an optimistic view and a continuation of the present demand for cars and trucks.

Orders have been reported during the past week from many foreign countries including China, Cuba, Spain, Brazil and the Hawaiian Islands for cars ranging from $500 to $3,500, with the latter grade in considerable demand. The license department of several Canadian provinces, including Manitoba, Saskatchewan and Alberta, shows an increase of 73 per cent in registered cars over 1916, an indication of the prosperity in Western Canada.

The farming and mining sections of the Middle West and in through and about Denver have been reported to be exceedingly prosperous and demanding cars. Bumper crops and unprecedented mining activities produced by war demands have created these conditions, and factory representatives returning to this city claim that farmers and miners will form the bulk of the motor car purchasers during the coming year.

The Ford Motor Co., Willys-Overland, Inc., Dodge Bros., Buick Motor Co., Paige Motor Car Corp., and other plants are operating at full force both in numbers employed and production. The Maxwell Motor Car Co., employing a full force of workers, is now swinging into capacity production following the change of its models.

Shipping conditions display a tendency toward the difficulties of last year and traffic managers predict a recurrence of shipping troubles. Freight cars are already becoming scarce and dealers are now driving home from 5 per cent to 15 per cent of the cars manufactured.

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Sayers Six Sells at $1,295

CINCINNATI, Sept. 4—The Sayers Six is being placed on the market by the Sayers & Scovill Co. The car is to be assembled from standard units, including a 3¼ by 4½ in. Continental L-head engine, Borg & Beck three-plate dry disk clutch and Delco electric system. The car will sell for $1,295. Some further particulars are as follows: Floating rear axle with Bower roller bearing, spiral bevel differential on ball bearings, Hotchkiss drive, semi-elliptic underslung rear springs fitted with self-oiling device, tires are 32 by 4 straight side with non-skid in rear, Stewart vacuum fuel feed system, three-speed selective sliding gear transmission, Fedders radiator, Willard storage battery and French plait leather upholstery. The body is a five-passenger touring type of long streamline effect. It has a center cowl and the tonneau is unusually roomy.

Equipment includes: Power tire pump; Boyce Moto-Meter; 60-mile speedometer, gear driven from universal joint; sloping rain vision windshield; one-person top with non-rattling bow holders, hood for top, demountable rims, with one extra; non-skid tires on rear wheels, foot accelerator with foot rest; two large headlights with dimmers; instrument light, combination rail light and license holder; trouble lamp, electric warning signal, Willard storage battery, robe rail, foot rail, tools, jack, tire repair kit, light and ignition switch locks.

The Sayers & Scovill Co. has produced chassis for ambulance and other special vehicles for the past 10 years.

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Saxon Selling Springwells Plant—Lowers Price on Four

DETROIT, Aug. 31—The Saxon Motor Car Co. has put its Springwells plant on the market in order to secure working funds. It has also reduced the price of its four-cylinder car $100. This reduction, it is stated, will probably remain only until Christmas. The car now sells for $395.

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Peerless Prices to Rise

NEW YORK, Sept. 3—Peerless car prices are expected to advance in the near future. Prices are expected to go up about $250 on each model.

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Murray Prices Raised to $2,800

NEW YORK, Aug. 31—The Murray Motor Car Co., Pittsburgh, Pa., will raise its prices Sept. 1 from $2,550 to $2,800 on the seven-passenger touring car, four-passenger touring, and roadster.

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Koehler Truck Prices $55 Higher

NEWARK, N. J., Sept. 1—The Koehler Motor Corp. has increased the prices of Koehler trucks from $995 to $1,150.

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No Successor to Souther Needed

WASHINGTON, Sept. 5—No successor is to be appointed to Major Henry Souther who died recently in a hospital at Norfolk, Va., where he was engaged in work connected with the aviation service and under the Council of National Defense. The work on which Major Souther was engaged has progressed to such an extent, it is stated, as to permit of it being taken over by others already in the service.

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Federal Tractor Succeeds Tom Thumb

MINNEAPOLIS, Aug. 31 — The Tom Thumb Tractor, maker of the Tom Thumb tractor, has been reorganized as the Federal Tractor Co. The company will continue the manufacture of the Tom Thumb tractor, although it is probable that the name will be changed later to Federal.

The officers of the company are: President, H. A. Brown, official in a large Chicago foundry and bank director; vice-president, J. N. Kirby, treasurer and manager of the St. Paul Machinery Mfg. Co.; secretary and treasurer, A. A. Robbins of Price, Robbins & Newton, paper jobbers; directors, R. W. Manuel, president of the Exchange State Bank of Minneapolis, and F. P. O'Malley, vice-president of the Security State Bank of St. Paul.

N. A. A. J. Members Indicted

Charged with Conspiracy to Restrain Trade—Little Apprehension—Denial from Assn.

CHICAGO, Sept. 1—Indictment of sixteen manufacturers of automobile accessories, together with Wm. M. Webster, of Chicago, Commissioner of the National Association of Automobile Accessory Jobbers, and nearly a score of other individuals, charging conspiracy to restrain trade in violation of the Sherman Law, is causing little apprehension on the part of members of the association, according to Mr. Webster.

Price Fixing Charged

The Federal Grand Jury in New York returned an indictment Wednesday charging that the association was formed for the purpose of fixing prices and monopolizing the accessory trade, and that jobbers were required to sell goods which were sold to them at 40 per cent below list price, at or above list price, or be penalized by forfeiting their membership in the association.

Mr. Webster points out that the association has been working together with the Federal Trade Association, and declares there is an apparent lack of understanding between the Federal Trade Commission and all branches of the Department of Justice. He makes a strong denial of the price-fixing charge, and says that the association is within its rights in all its work and bases his contention on the advice of attorneys.

Among the Chicago individuals and corporations named in the indictment are: Willard W. Low, Thomas M. Brooks, Sidney F. Beech, Electric Appliance Co., Automobile Supply Co., and the Motor Car Supply Co.

Other individuals named are: J. Stanley Clemence, Portland, Ore.; George E. Edmunds, Detroit; Sidney B. Dean, St. Paul; Edward C. Graham, Washington, D. C.; F. Hallet Lovell, Jr., Newark, N. J.; Richard H. Englehart, Davenport, Ia.; William K. Norris, St. Louis; Harry R. Williams, Indianapolis; Fordyce B. Caswell, Toledo, O.; Charles E. Faeth, Kansas City, Mo.; Grant F. Discher, Milwaukee; William L. Ferrier, St. Louis; Henry P. Andrae, Milwaukee; William Sparks, Jackson, Mich.; Emil Grossman, Brooklyn, and Arthur M. Moody, Boston. While among the concerns named are the Fred Campbell Auto Supply Co., St. Louis; Ballou & Wright, Portland, Ore.; Edmunds & Jones Corp., Detroit; Nichols, Dean & Gregg, Inc., St. Paul; Wieg Company, Davenport, Ia.; McQuay-Norris Mfg. Co., St. Louis; Gibson Co., Indianapolis; Champion Spark Plug Co., Toledo, O.; Motor & Machinists' Supply Co., Kansas City, Mo.; Gemco Mfg. Co., Milwaukee; Julius Andrae & Sons Co., Milwaukee; Sparks-Withington Co., Jackson, Mich.; Emil Grossman Mfg. Co., Brooklyn, N. Y., and the Wetmore-Savage Co., Boston.

Marmon Returns From Europe

Takes Up Work Done by Vincent—Commends U. S. Aviation Engine

WASHINGTON, D. C., Sept. 6—*Special Telegram*—Captain Howard Marmon, who returned Saturday from his trip to England, France and Italy, where he went to visit all of the aviation factories and study the problems of aviation, has taken up his office in the Bureau of Standards, where he will carry on the work done by Jesse G. Vincent. Mr. Vincent will continue his work on the testing fields, where he will observe the performance of engines and work hand in hand with Mr. Marmon. Captain Marmon is particularly impressed with the U. S. aviation motor which has been developed in Washington and which does not contain any radical features of design but which has incorporated in it the best aviation engineering practice of all the warring nations. Captain Marmon thinks it practically a marvel that this engine should have been developed and tested out in such a short time under Mr. Vincent. Compared with the European engines it is an excellent product. Captain Marmon feels that Italy is the leader in aviation, notwithstanding the great progress that has been made by France and England. Italy's problem has been that of building machines to scale the mountain tops and carry large tonnage of bombs, a problem which is greater than that having to be faced by the other Allies. When Captain Marmon sailed for Europe several men from different factories went with him, the majority of whom are still abroad to execute Captain Marmon's orders.

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Paige Shows New Models

DETROIT, Sept. 6—The Paige-Detroit Motor Car Co. has secured a large Auditorium and is showing the new Paige cars to dealers to-day and to the public to-night. There is a new limousine and town car at $3,230 and a convertible sedan and coupe at $2,850. A cabriolet will be ready in 60 days.

The company has established a new closed car department which has developed a special decorative scheme for all Paige closed cars. Seats, carpets and sides are all different but harmonious in effect; the same applies to dome lights, etc., the company having developed what it calls the Kentucky Rose effect. The windshield is stronger and is entirely weatherproof, there is a new tire carrier in the rear and wire wheels are standard. Color may be either brown or blue.

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Chalmers Meets Sept. 10 to Decide on Capital Increase

NEW YORK, Sept. 4—Stockholders of the Chalmers Motor Corp. will meet here Sept. 10 for the purpose of voting upon a proposed increase of its capital stock from $3,000,000, consisting of 600,000 shares without any nominal or par value, to $7,060,000, to consist of 532,000 shares without any nominal or par value, and 44,000 shares with a preference as to principal of $100 each, and to dividends of $8 per share per annum, and the issuance and disposition of such stock. Action will also be taken in regard to the leasing of the plant to the Maxwell Motor Co.

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Deeds and Waldon Promoted

WASHINGTON, Sept. 5—Majors E. A. Deeds and Sydney D. Waldon, both in the engineers' division, signal corps of the army, have been promoted to colonels.

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Stearns Men Join Willys

TOLEDO, Sept. 6—Henry Hower, sales manager of the F. B. Stearns Co. has resigned to become sales manager of the Willys-Knight division of the Willys-Overland Co. Edward McEwen, secretary and treasurer of the Stearns company, and J. J. McDuffee, division coast sales manager, have also joined the Willys-Overland organization.

N. A. C. C. To Abolish Cut-Outs

Members Vote Against Noisy Exhaust—Chalmers Succeeds Leland as V-P.

NEW YORK, Sept. 6—As the use of muffler cut-outs is becoming a nuisance, the members of the National Automobile Chamber of Commerce has voted unanimously for the elimination of cut-outs on the cars they build in the future, so far as such cut-outs can be operated from the driver's seat.

Almost half of the 110 makers in the Chamber do not fit muffler cut-outs to their present cars and all makers feel that they should be eliminated in the new products. This new resolution will go into effect Jan. 1.

At yesterday's meeting the directors elected Hugh Chalmers, president of the Chalmers Motor Co., to be first vice-president of the N. A. C. C., taking the place of W. C. Leland, who leaves the automobile industry to enter the aeronautical industry. H. H. Rice, treasurer of the General Motors Co., was elected to fill the office that was held by Mr. Chalmers as vice-president of the Gasoline Division.

The directors endorsed the Webb-Pomerene bill now before the Senate, having for its purpose the encouragement of combinations of American manufacturers and exporters to promote American trade abroad. The export Committee feels that operating under that measure would materially help in securing the world's trade for automobile makers.

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Weidely Engines for Cleveland Plow

INDIANAPOLIS, Sept. 5—The Weidely Motor Co. has received a 3-year contract to supply Weidely overhead-valve, four-cylinder engines at the rate of 5000 per year to the Cleveland Motor Plow Co. of Cleveland.

New Companies

MADISON, WIS., Sept. 1—The Cruiser Motor Car Co., a Maine corporation with $250,000 capital, has been organized by Chicago and Madison capital to establish a plant for the manufacture of a new type of convertible touring-camping car. A charter has been granted in Wisconsin, and the local interest is given as $100,000, which will represent the cost of a plant and the equipment. Work will begin immediately and the factory is to be ready in about 90 days.

The officers are: President, W. D. Curtis, Madison, Wis.; vice-president and general manager, Winthrop J. Burdick, formerly treasurer and sales manager, New Era Engineering Co., Chicago; secretary, Dwight S. Bobb, of Adams, Crews, Bobb & Westcott, Chicago, financial and corporation attorneys; treasurer, George C. Riley, Madison. C. A. Schimberg and E. J. Haines, Chicago, have been appointed sales managers.

The Cruiser car will be of standard mechanical design, but embodying many novel features, such as a self-contained outing and camping equipment. It will be made both as a roadster and touring type. The roadster model, fully equipped, will list at $1,185, or $1,250 with wire wheels.

It is stated that the Government already has indicated that it will purchase 500 of these cars. Models have been undergoing exhaustive army tests for nearly a year.

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DEFIANCE, OHIO, Sept. 1—The Turnbull Motor Truck & Wagon Co. has been incorporated with an authorized capital stock of $1,000,000 to manufacture automobile trucks and trailers. The incorporators are W. C. Allen, C. C. German, R. G. Holgate, H. B. Tenzer and T. T. Shaw.

W. O. Allen, who is general manager and treasurer of the Allen Motor Co., Fostoria, is president of the new company.

The Turnbull truck will be of 1½ ton capacity. The plant has a capacity of 5000 to 10,000 trucks per year.

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ST. LOUIS, MO., Sept. 1—H. P. Mammen, for several years sales manager of the Westcott Motor Car Co., of Springfield, Ohio, has opened an office here for the organization of the Traffic Motor Truck Corp., which plans to begin operations with $500,000 capital. It is the intention to have a factory here. It will specialize in a 2-ton truck. Mr.

Mammen has associated with him Guy Wilson, for several years with the Brandle Motors Co., Westcott distributors here.

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Government May Form Motorcycle Schools

SPRINGFIELD, MASS., Sept. 1 — The Hendee Mfg. Co. has addressed its agents throughout the country stating that the War Department is considering the formation of motorcycle companies and also schools for instruction in the use, operation and care of motorcycles, and requests all individuals who ride or repair motorcycles to register with the various agents.

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Miller Rubber Business 85 Per Cent Better

AKRON, Sept. 4—The Miller Rubber Co. during the first 7 months of 1917 showed an increase of 85 per cent in the volume of business over last year. This means a total volume for the entire year of between $10,000,000 and $12,000,000. The directors expect to pay a stock dividend of not less than 20 per cent on the present issue of $3,000,000 of common stock.

It is the intention of the board of directors to advise the holders of common stock that the company will sell to the stockholders, at par, common stock of the company to the amount of 20 per cent of their holdings of record as of Oct. 15, 1917, at which time the right of stockholders to subscribe for this new stock at par expires.

One-half of the subscription price of this new stock is payable on or before Nov. 1, 1917, and the remaining one-half on or before May 1, 1918. Interest at the rate of 6 per cent per annum will be charged against this remaining one-half of the subscription from Nov. 1, 1917, to May 1, 1918. However, it must be paid in full on or before the latter date.

This new stock will be issued whenever it is paid for in full after Nov. 1, 1917. After that time no interest will be paid as the new stock will be subject to dividends after the stock is issued, which will be on the date of full payment.

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Late Dividends

Kelly-Springfield Tire Co., quarterly of $1.50 per share on 6 per cent preferred stock, payable Oct. 1 to stock of record Sept. 17.

Electric Storage Battery Co., $1 per share from net earnings on common and preferred, payable Oct. 1 to stock of record Sept. 17.

Edmunds & Jones, $1 per share on common and quarterly of $1.75 on preferred, payable Oct. 3 to stock of record Sept. 20.

Willys-Overland Co., quarterly of $1.75 per share on preferred, payable Oct. 1 to stock of record Sept. 20.

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Ford Gives $500,000 Credit for Ambulances

WASHINGTON, Sept. 3—The American Red Cross is preparing to send to the western front in France a large additional number of ambulances as a result of a gift from the Ford Motor Co. in the form of a credit to the extent of $500,000 on the Ford factories for automobiles, ambulances, parts, etc., as may be designated by the Red Cross.

Overland Co. Earns $6,000,000

6 Months' Activities Show Output of 91,489 Cars Compared with 94,477 in 1916 Period

NEW YORK, Aug. 31—The Willys-Overland Co. in the first 6 months showed earnings of $6,000,000, which, after allowing for proportionate dividend requirements on the $15,000,000 preferred stock, is equal to 14.72 per cent on the $37,273,844 common stock outstanding, or $3.68 a share, $25 par value. The output in the first half year period amounted to 91,489 cars, compared with 94,477 in the same period of 1916.

Earnings of $6,000,000 for the 6 months ended June 30 compares as follows with the calendar year 1915 and 1916, and with the ½ year ended Dec. 31, 1914, which was the time of the change of the fiscal period of the company from the June 30 year to the calendar year:

	6 Mos. June 30 '17	12 Mos. Dec., 1916
Net profit	$6,000,000	$10,016,420
Preferred dividend	525,000	1,050,000
Surplus	5,475,000	8,966,420
Per cent on com	14.72	24.1
	12 Mos. Dec., 1915	**6 Mos. Dec., 1914**
Net profit	$10,870,678	$3,160,099
Preferred dividend	322,164	165,235
Surplus	10,548,514	3,003,864
Per cent on com	50.23	15.01

The above earnings are presented on a percentage basis, as the par value of the stock was reduced from $100 to $25 a share in June, 1916.

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Receiver for Gillette Motor Co.

MISHAWAKA, IND., Sept. 6—A receiver has been appointed for the Gillette Motors Co.

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FINANCIAL

NEW YORK, Sept. 3—The United Motors Corp., which will be able to take care of a large amount of airplane business from the Government, has, through its extensive expansion program, added at least 75 per cent more capacity during the past year. There are no improvement plans of moment contemplated in the near future. The seven concerns, if the business was offered, and if continuous capacity operation was assured, could probably, on their present basis, turn out $60,000,000 of accessory products per annum.

The Harrison Radiator Co., Lockport, N. Y., has been increased five-fold since its affiliation with the United Motors Corp., and now has facilities for a business in the current year to next July of $6,000,000. If contracts now on its books are filled for the coming 12 months it is expected that the company could contribute a $1,000,000 profit to the United Motors' treasury in the 1918 fiscal year.

The Perlman Rim Corp. is expected to do a $4,000,000 gross business this year. The Klaxon Co. is relatively small, doing less than $1,000,000 a year. The bulk of the $33,000,000 of business last year was done by the Hyatt plant, the New Departure Mfg. Co., the Delco unit and the Remy Electric Co.

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NEW YORK, Sept. 1—The Republic Motor Truck Co. is offering stockholders of record Aug. 31 the right to subscribe to 23,675 shares of new common stock at $55 a share, on the basis of one share of new stock for every three shares of common now held.

The annual report for the fiscal year ended June 30 shows net profits of $1,384,227 accruing to the new company, after deduction of $273,107, which accrued prior to date of acquisition of the respective properties, etc. Dividends paid on the preferred stock amounted to $85,538, and expenses of preferred stock issues totaled $32,199. After the deduction of these two items and the addition of $247,179, surplus arising from reappraisal of properties, there remained a balance of $1,513,669 available for the 76,325 shares of common of no par value. This balance is equivalent to approximately $20 a share earned on the common stock in the fiscal period.

The company's consolidated balance sheet, as of June 30, 1917, follows:

Assets

Land, buildings, equipment, etc.	$1,671,216
Subsidiary co-patent rights	63,663
Inventories	4,541,971
Accounts receivable	581,518
Due from officers and employees	17,794
Customers' defrd. installment notes	51,958
Notes receivable	13,347
Liberty Loan subscriptions	3,160
Cash	441,035
Prepaid insurance premiums, etc.	16,804
Total	$7,402,468

Liabilities

Preferred stock	$1,000,000
Common stock—no par value	1,007,456
Subsidiary co-capital liabilities	726,500
Notes payable	770,000
Accounts payable	2,087,948
Accrued payrolls	88,898
Accrued commissions	19,745
Accrued taxes	42,955
Bonuses payable, etc.	51,288
Dealers' deposits	94,009
Surplus	1,513,669
Total	$7,402,468

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Scripps-Booth May Increase Capital

NEW YORK, Sept. 1—Stockholders of the Scripps-Booth Corp. will vote upon the proposition to increase the capital from 70,000 shares of no par value to 120,000 shares of no par value at a meeting to be held in this city Sept. 10.

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Studebaker Sales Increase — Estimated Earnings 14 Per Cent on Common

SOUTH BEND, Sept. 1—Sales of Studebaker cars have improved steadily of late and the week before last, the latest period for which data are available, reached the highest point for any week since that of May 5, with a total of just under 1000 cars. Sales to date since Jan. 1 are over 31,000 cars compared with about 45,000 for the same period of a year ago.

There has been no new borrowing by the Studebaker Corp. and bank loans stand at somewhat under $11,000,000, it is stated. The 6 months' period ended June netted a profit of just under $3,000,000, and the second half year, it is expected, should contribute better than $2,000,000. This balance compares with

$8,611,245 in 1916, and though smaller, would be sufficient to cover preferred dividends and leave a balance equal to about 14 per cent on the $30,000,000 common stock outstanding.

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CAPITAL CHANGES

YOUNGSTOWN, OHIO, Sept. 1—Engel Aircraft Co., from $10,000 to $3,000,000. Company has option on plant of Niles Car Manufacturing Co.

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COLUMBUS, OHIO, Sept. 1—The Wright-Dayton Aeroplane Co., Dayton, Ohio, has applied for permission to increase its capital stock from $500,000 to $1,000,000.

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ST. LOUIS, MO., Sept. 4—The Whitman Bull Tractor Co. is offering $600,000 8 per cent preferred stock to finance the taking over of the plants of the Toro Motor Co., St. Paul; the Bull Tractor Co., Minneapolis, and the Whitman Agricultural Implement Co., St. Louis.

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SAGINAW, MICH., Sept. 4—The Saginaw Motor Car Co. will increase its capital stock to secure working capital for large quantities of material necessary to the increasing business which the company is enjoying. Plans are for the production of 1000 cars in 1918. The company's present capital is $100,000.

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TOLEDO, OHIO, Sept. 2—The Beacon-Lite Auto-Signal Co., of this city, has raised its capitalization from $7,000 to $25,000.

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DIVIDENDS DECLARED

Pierce Arrow Motor Co., quarterly of 2 per cent on preferred, payable Oct. 1.

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Stutz Motor Car Co. of America, quarterly of $1.25 a share, payable Oct. 1 to stock of record Sept. 15.

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Packard Motor Car Co., quarterly of 1¾ per cent on preferred, payable Sept. 15 to stock of record Aug. 30.

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Stromberg Carburetor Co.. quarterly of 75 cents a share, payable Oct. 1 to stock of Sept. 15.

Automotive Issues Weak

Airplane and Motor Vehicle Stocks Feature Decline—Packard Strong

NEW YORK, Sept. 5—Prices broke sharply last week and new low records were established among the automotive issues. Chevrolet led the downward movement by declining 17 points. General Motors common dropped 5¼ points and its preferred 2 points; United Motors sold at its low level of 20¼. War stocks were no exception to the downward trend, Wright-Martin selling at a new low for the movement at 8⅛. Curtiss quoted yesterday at 39, just 6 points below the previous Tuesday's mark.

The break in prices was attributed to a bear raid and the general decline of prices in the Stock Exchange. Few gains were made in the automobile field, which was featured by a 14 point gain for the week by Packard common. J. I. Case was strong at 79⅞, a gain of 1⅞ points.

Tire issues held strong this week on account of the announcement of a general increase of tire prices. Few losses were recorded. The rise of 10 points on the Miller common was the feature of the tire issues.

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Leonard Tractor Stock Approved

LANSING, MICH., Aug. 31—The Michigan securities commission this week gave the Leonard Tractor Co. permission to sell $500,000 worth of preferred stock. The company in its application showed that all of its common stock, $1,000,000, had been given for patent rights on the tractor it proposes to manufacture. This right was extended by the commission as being worth $200,000 in stock, and the commission orders the return of all but $200,000 worth of the common stock to the company's treasury and places the $200,000 in escrow with the commission until 6 per cent is paid out on the earnings of all stock issued. Of the $800,000 common stock in the treasury $625,000 is to await orders of the commission, while the other $175,000 is to be given as a bonus to the purchasers of the preferred. If these conditions are met the sale of the stock may go on.

The National Hearse & Motor Co., Grand Rapids, which has as its basic part the Michigan Hearse & Motor Co., which it took over for $300,000 worth of stock in the new concern, was told by the commission that the Michigan Hearse & Motor Co. has assets of but $102,000 and a deficit of $28,000.

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Porter Co. to Sell $50,000 of Stock

ANN HARBOR, MICH., Sept. 1—The Porter Mfg. Co. has been granted permission by the Michigan securities commission to sell $50,000 worth of treasury stock. The additional capital is to be used for rapidly increasing business.

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Two New Murray Models

PITTSBURGH, Aug. 31—The Murray Motor Car Co. has brought out two new models, one of which is a four passenger touring car and the other a roadster. The lines of these cars are quite different from the touring car and combine the Rolls-Royce radiator with the straight line low body effect. The short bevel corner is carried out all the way around the body on the four passenger touring car as well as on the roadster, the lower corner of which runs into the hood hinge. This bevel effect is carried out on other parts of the car, such as the windshield.

The seven-passenger touring cars remain the same as before with just a few minor refinements added to it. The chassis is practically the same. The wheelbase on all these cars is 128 in. and the price of the seven-passenger, four passenger and roadster is $2,800, f.o.b., Pittsburgh.

These bodies are constructed entirely out of aluminum. No. 1 hand buffed leather is used throughout. The roadster has two auxiliary seats on the rear deck.

Automotive Securities Quotations on the New York Exchange

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	58	62	—6
*J. I. Case T. M. Co. pfd.	79⅞	84	+1⅞
Chalmers Motor Co. com.	7	11	—1
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Car Co.	78½	79	—3¼
Chevrolet Motor Co.	70	73	—17
Curtiss Aeroplane	39	39½	—6
Fisher Body Corp. com.	30	38	—5¼
Fisher Body Corp. pfd.	86½	90	—1½
Fisk Rubber Co. com.	65	70	..
Fisk Rubber Co. 1st pfd.	104	106	..
Fisk Rubber Co. 2nd pfd.	92	95	..
Firestone Tire & Rubber Co. com.	115	120	..
Firestone Tire & Rubber Co. pfd.	102	105	..
*General Motors Co. com.	105¾	106¼	—5¼
*General Motors Co. pfd.	82⅜	87	—2
*B. F. Goodrich Co. com.	45½	46¼	—1¾
*B. F. Goodrich Co. pfd.	100	105	—3
Goodyear Tire & Rubber Co. com.	186	191	—1
Goodyear Tire & Rubber Co. pfd.	105	106	..
Grant Motor Car Corp.	3	5	—1
Hendre Mfg. Co.	25	32	..
Hupp Motor Car Corp. com.	3	4	— ¼
Hupp Motor Car Corp. pfd.	80	85	—1
International Motor Co. com.	9	13	..
International Motor Co. 1st pfd.	30	60	—5
International Motor Co. 2nd pfd.	15	30	..
*Kelly-Springfield Tire Co. com.	42¾	45	—1¼
*Kelly-Springfield Tire Co. 1st pfd.	87	95	..
*Lee Rubber & Tire Corp.	19	20	—1

	Bid	Asked	Net Ch'ge
*Maxwell Motor Co., Inc. com.	31	32	—1⅜
*Maxwell Motor Co., Inc. 1st pfd.	66	69	—1½
*Maxwell Motor Co., Inc. 2nd pfd.	19	20	—1¼
Miller Rubber Co. com.	175	180	+10
Miller Rubber Co. pfd.	102	104	..
Packard Motor Car Co. com.	153	160	+14
Packard Motor Car Co. pfd.	96	99	+2
Paige-Detroit Motor Car Co.	24	26	..
Peerless Truck & Motor Corp.	13	15	..
Portage Rubber Co. com.	140	145	—5
Portage Rubber Co. pfd.	..	..	..
Regal Motor Car Co. pfd.	15	20	..
Reo Motor Car Co.	27	29	+2
*Saxon Motor Car Corp.	13	14½	—3
Springfield Body Corp. com.	2	8	..
Springfield Body Corp. pfd.	10	20	..
Standard Motor Construction Co.	9	10	— ½
*Stewart-Warner Speed. Corp.	53	55	—2
*Studebaker Corp. com.	44⅝	45⅝	—7
*Studebaker Corp. pfd.	..	96	..
Swinehart Tire & Rubber Co.	..	60	..
Submarine Boat	25	28	—3¾
United Motors Corp.	20¼	20¾	—3¼
*U. S. Rubber Co. com.	59¾	60	—2¾
*U. S. Rubber Co. pfd.	104¾	105	—1
*White Motor Co.	43½	44	—1½
*Willys-Overland Co. com.	27¾	28¼	—2¾
*Willys-Overland Co. pfd.	93	96	—1
Wright-Martin	8⅛	9⅛	—1⅞

*At close September 4, 1917. Listed New York Stock Exchange.

Industrial Review of the Week

A Summary of Major Developments in Other Fields

NEW YORK, Sept. 6—Few business failures have been recorded during the past month. The percentage is usually low during this time of year, but the casualties for August were lower even than the usual summer rate. There were only 999 failures in August, 1917, or less than in any month for four years past. This is a decrease of 4.7 from July and of 23 per cent over August of last year. The prices to be paid by the Government for steel, soon to be announced, will be fixed upon the basis of the cost of production plus a reasonable profit. This adjustment, it is believed, will enable the small manufacturer to compete with the big manufacturer, at the same time stimulating the manufacture of steel as the Government will take over every pound of this product which can be manufactured.

Normal Business Waking Up

One of the biggest events in the architectural field this week was the filing of plans for a $500,000 addition to Macy's department store, New York City. At a time when the bulk of activity is along Government lines this is a live sign in the line of civilian business. The Government has recently let a $300,000 contract for warehouses along the East River, New York, where army supplies will be stored.—*F. W. Dodge Construction Reports.*

Railroads Expect Rush

With the movement of the cotton crop scheduled to begin this Fall, at a time when a combination of government and commercial business will be bringing tremendous pressure to bear upon the railroads, the shipping of cotton in quantities less than sixty-five bales per car is prohibited.

The New England territory will be taxed to the maximum capacity of facilities this Fall and the acceptance of freight by the railroads serving the territory north of the Ohio and Potomac Rivers will have to be carefully regulated.—*Railway Age Gazette.*

Anthracite Orders Still Behind

Anthracite producers are still behind on July and August orders. The demand has been extraordinary. As to output and distribution, August figures will be large, despite several strikes and a number of holidays.

Operators naturally availed themselves of the prices allowed by the government's recent order. As is well known, the real advance over the big companies schedule was on pear, which at $4 is 90 cents above what had been Reading's circular. Individual operations are allowed 75 cents above these quotations of the railway-owned companies.

There is as yet practically no market in bituminous coal. Dealers are unable to purchase any coal at the government prices, so have none to offer. Operators are attending to their contracts, which practically absorb the output of most of the mines. Nearly all mines, even those without long term contracts, have orders taken prior to the President's announcement, at remunerative prices, which will keep them busy from 60 to 90 days.

The fixing of prices on anthracite has had but little effect upon the market. These prices coincide closely with those of the larger companies and they have consequently not affected the general market to any appreciable degree.

The coal administration has ruled that bona fide contracts for the purchase or delivery of coal, enforceable at law, made before Aug. 21 will not be interfered with by the administration, even though such contracts are not in accord with prices and conditions fixed in the President's proclamation as to the prices of coal. This order came as a result of a stream of inquiries reaching Washington as to what would be done in cases of this kind, many operators and wholesalers having made contracts at prices in excess of those fixed by the government. In making this concession, however, the coal administration also made it plain that only bona fide contracts would be honored, and that any efforts to put one over on the government by seeking to indefinitely extend such contracts, or to in any way take unfair advantage of the recognition by the government of such contracts, would meet with instant reprisals.—*Coal Age.*

Coke Shortage Depresses Iron Industry

The August pig-iron statistics emphasize again the little success of blast furnace operators in the face of coke scarcity. The output was 3,247,947 tons, or 104,772 tons a day, against 3,342,438 tons in July, or 107,820 tons a day. New modern blast furnaces were started last month at five steel plants—Midvale, Bethlehem, Donner, Republic and Whitaker-Glessner—yet with all this reinforcement production declines. Many furnaces were banked for days at a time for lack of coke.

On Sept. 1, 357 furnaces were in blast, with daily capacity of 110,165 tons, while 351 furnaces with daily capacity of 109,248 tons were active on Aug. 1. The situation is well indicated by the fact that 25,660,000 tons of pig iron was produced in the first eight months of the year, or 175,000 tons less than in the first eight months of 1916, and yet 38 more furnaces were in blast at the opening of this month than on Sept. 1, 1916.

The markets for pig iron, semi-finished steel and rolled products continue to drift. Indications of coming readjustments are chiefly those given by resale transactions, which are but meager basis for conclusions. At Pittsburgh there has been no duplication of the sales in steel-making pig iron, which in the last week of August showed a softening market, but offers of resale billets and slabs at $70 as against $100 in July are ample comment on the disappearance of competitive buying of shell steel for Europe.

The market for foundry pig iron is uniformly easier, due to constant offerings of resale iron, but the concessions are not great, nor is the business considerable. Some foundrymen bought more iron for 1917 than they will need; others are pressing the furnaces for deliveries. In the East $50 No. 2 foundry iron is now offered, as against a recent furnace price of $52.—*Iron Age.*

Deadlock in Rubber World

There has been a deadlock between producers and consumers in the crude rubber world during the past week. The consumers are making bids which the producers will not accept and there the matter rests. This is a dull season for the trade and there is little activity except where artificially stimulated by Government orders.—*India Rubber World.*

Indiana Electric Power Rates Higher.

Electric power rates have been increased in Indiana in accordance with a decision of the state commission. This ruling will likely affect the entire country indirectly, as it will establish a precedent for increased schedules. The ruling affects only the big customers, not small business. Electric power companies all over the United States have been petitioning the authorities for permission to make higher charges due to the increased cost of operating expenses, especially of coal. The big producers in the electrical world are encouraged by this move in Indiana, as they believe it is an indorsement of their position.—*Electrical World.*

Textile Market Dull

Business in the textile world has been very dull for the past few days, partially due to the holiday. Pending the decision on the prices of raw materials, however, there is little being done in the

A New Service

¶Herewith THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial cooperation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

fabric trade. Some of the big mills are not preparing their usual fall lines this year as they are already sold up with Government orders.—*Textile World Journal.*

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Cooper Wins at Tacoma

TACOMA, WASH., Sept. 3—*Special Telegram*—Earl Cooper's Stutz won the 100-mile army post special and the $1,000 prize money on the Tacoma speedway this afternoon. Cliff Durant in a Chevrolet was second, Patterson in a Hudson third, and Moosie in a Duesenberg fourth. Only five cars started and all finished except Crosby's Duesenberg. During the first ten laps the cars were bunched, Cooper leading except in one lap when Durant passed him. At the end of ten laps Moosie nosed out Durant and Crosby, Durant being in fourth place. In the twelfth lap Cooper lapped Patterson, but a pit stop for a left front tire in the 37th lap cost Patterson second place. Moosie's Duesenberg gave Cooper's Stutz a hard battle until it blew a tire on a turn and spun around twice on the track and limped to the pits. Near the end of the race Cooper was two laps ahead of his closest rival. Durant took second money, $800, making the distance in 1:11.30. Patterson was third, winning $500, and Moosie fourth, winning $200.

In a challenge race of 25 miles between Durant and Patterson, Durant won averaging 85 m.p.h. Durant's time was 17:54, and he finished ½ mile ahead of Patterson.

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Miss Detroit II. Makes 56.3 M.P.H.

MINNEAPOLIS, MINN., Sept. 4—A new world's record of 56.3 m.p.h. for motorboats was made recently by the motor boat Miss Detroit II., driven by Gar Wood in the second of a series of three 30-mile races for the gold challenge cup of the American Power Boat Assn.

More Motorcycle Standards

Spark Plug Thread Tolerance and Tube Joints Standardized at Meeting

CHICAGO, Aug. 30—A meeting of the Military Motorcycle Standardization Committee took place here yesterday at the Congress Hotel. One of the most important subjects that came up was the proposal to standardize a light type of motorcycle for dispatch-bearing purposes. After a lengthy discussion it was agreed that American manufacturers have not had sufficient experience in the matter of light weight motorcycles for military service to either recommend or reject them, and they therefore suggest that the Government make such tests as may seem necessary to determine their relative merits. The committee will then be pleased to make such further investigations and attempts at standardization as the situation will permit.

Among the items of standardization taken up was that of spark plug thread tolerance, and it was decided to adopt the same tolerances as has been adopted by the aviation section of the Standards Committee and by the English Engineering Standards Committee. These tolerances are as follows:

Dimensions of Spark Plug Thread

	Maximum		Minimum	
Diameter	Millimeter	In.	Millimeter	In.
Outside	17.975	0.708	17.850	0.703
Pitch	17.091	0.669	16.876	0.664
Root	15.864	0.625	15.739	0.620

Dimensions of Tapped Hole

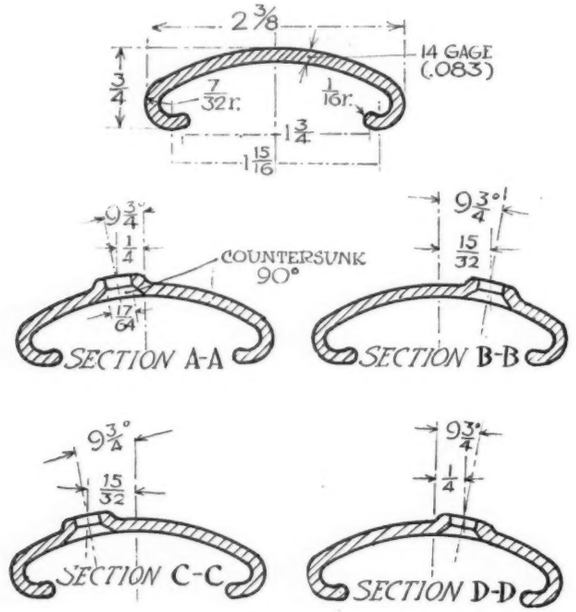
Outside	18.325	0.721	18.187	0.716
Pitch	17.176	0.676	17.051	0.671
Root	16.201	0.638	16.076	0.633

In regard to the driving keys for magnetos, it was learned that the key at present in almost universal use is a special Woodruff key, and it was decided to ask the manufacturers of Woodruff keys to give this special key a number and include it in the table of standard keys. Work is being done by the committee on a standard form for weight specification, a sub-committee consisting of Messrs. Butler and Herrington having been appointed for the purpose. A careful review is to be made of the present S. A. E. standards to see how many of them are applicable to motorcycle manufacture. This is being looked after by Mr. Rottweiler.

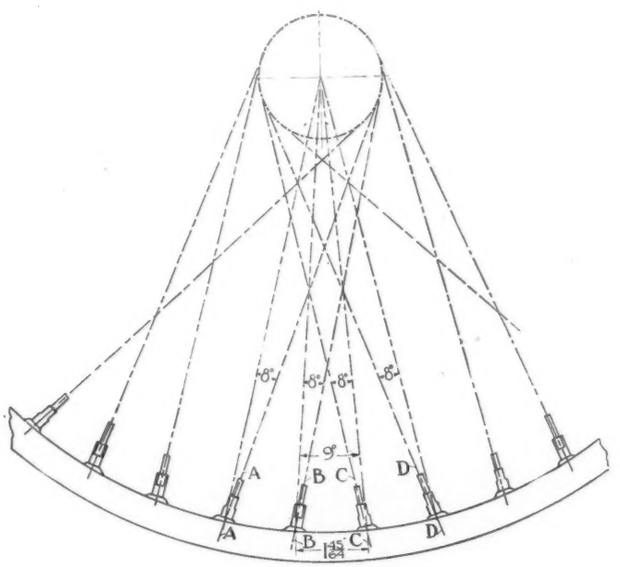
Saddle Mounting

Among new subjects that have been suggested for standardization and on which sub-committee reports will be made at the next meeting are that of saddle mounting, which is being investigated by Mr. Hedstrom, and that of license plate size and mounting, which is being looked after by Mr. Rottweiler. An attempt will also be made to standardize wheel hubs, and the various members of the committee have been requested to bring to the next meeting drawings of their hubs of front, rear and side car wheels. Practically all of the items which the committee originally started out to standardize have now been disposed of, with the exception of spokes and nipples. There was again some confusion at the meeting regarding present practice, and it was decided to get further information from the spoke manufacturers on this subject before taking final action.

An interesting report was made by William S. Harley regarding tests made by him of different tube joints. Mr. Harley tested six different types of joints in the endurance machine herewith illustrated. The testing apparatus consists of a board which is subjected to heavy vibration by means of a lobed wheel which is power-driven. On the board is mounted a length of tube with a coil in it, connected by the joint to be tested to a



Various sections through the rim



Standard tangent spoke motorcycle wheel

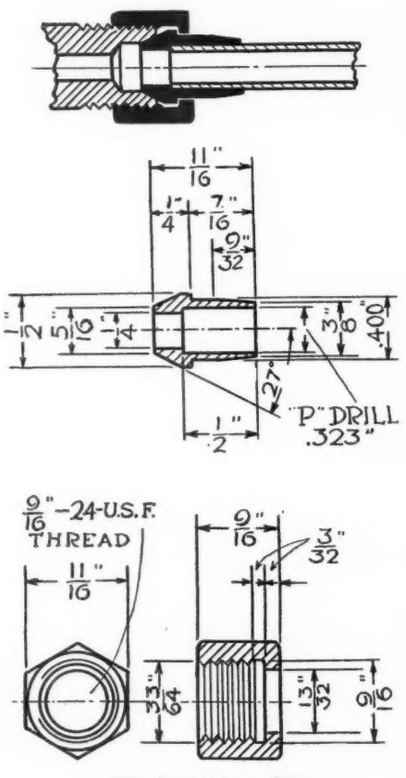
fitting on the board. Six different designs of joints were submitted to the test, of which three, of the so-called soldered type, were similar in design except for the length of the soldered joint, which was ½, ¾ and 1 in. respectively, for a 5/16-in. tube. It was found that the ¾ in. type had the longest life, but inasmuch as its life was only very little greater than that of the ½-in. type and as it could not be soldered so well it was the consensus of opinion that the ½-in. type was preferable.

Changes Recommended

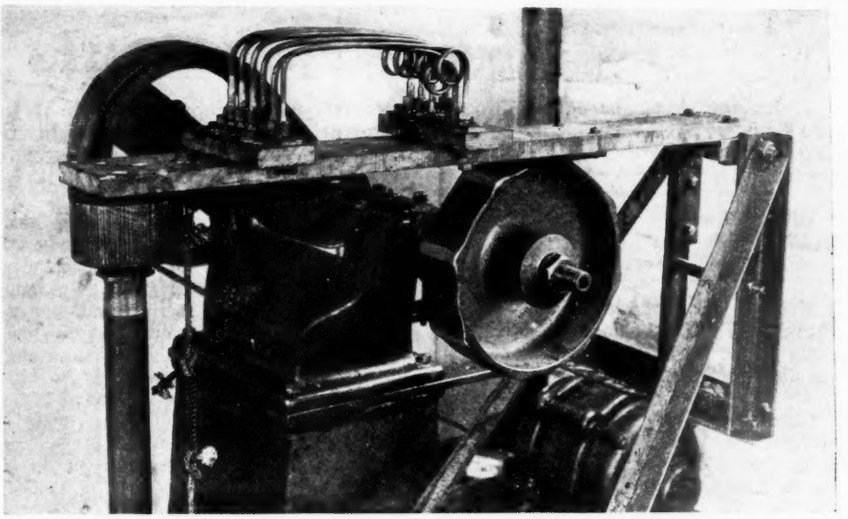
On the following day a meeting of a sub-committee on organization was held in Milwaukee. At a previous meeting in Washington, attended by Quartermaster-General Baker, Major Drake and Major Fourlough, much interest was shown by these officers in the co-operation extended by the committee. They handed the committee a tentative organization schedule, and it was the purpose of the Milwaukee meeting to review this schedule and make recommendations. Certain changes were recommended, these being based on the experience of the service departments of large manufacturing concerns and on experience gained on the Mexican border. Recommendations were made for the establishment of centralized control, of training camps and of base and field repair shops.

Meeting on Oct. 1.

Another meeting of the Military Motorcycle Standardization Committee will be held in Chicago Oct. 1, at which many of the subjects discussed at the meeting here reported will be acted upon.



Standard tube unions



Harley-Davidson Endurance machine used to test pipe unions

Car Sales Gain in Argentina

Winter Business in U. S. A. Medium-Priced Vehicles Shows Marked Increase

BUENOS AIRES, ARGENTINA, Aug. 3—In spite of the fact that Argentina is going through the winter months, being South of the Equator, and so having winter when the United States has summer, the sale of medium-priced cars has kept up and, in fact, in the case of the Ford has increased. During May the sale of Fords in Argentina was 709 cars; in June, 619; and there were over 300 orders on hand at the start of July for immediate deliveries. Although freight rates have gone up enormously the price of the Ford car was reduced on June 10 from $1,700 to $1,600 Argentina currency. This price approximates $680 in United States currency.

De Palma Features at Chicago

CHICAGO SPEEDWAY, Sept. 3—De Palma this afternoon won his first race on the local speedway. Driving his Packard he set a new mark of 11:02.07 for the 20 mile event and another record of 28:09.38 for the 50-mile. A tire change, although made in 19 seconds in the 100-mile race, forced him into third place at the finish. Louis Chevrolet won that event in 56:29.50 with Lewis in the Hoskins, second.

Eight cars started in the first event of 20 miles. Louis Chevrolet went out early in the race with a broken connecting rod. De Palma's time for the distance was equal to 108.7 m.p.h. In this event he broke his own record on the local track made last October in a Peugeot in 11:34.

De Palma's time for the 50 miles was at the rate of 106.6 m.p.h. In that event the Olson, driven by Trekus, went out with a broken tie rod and the Ogren had spark plug trouble.

Six cars started in the 100-mile race. Chevrolet averaged 106.02 m.p.h. for the distance, a new mark for the local track.

The results of each event follow:

20-MILE EVENT

	10 Miles	20 Miles
De Palma	5:33.63	11:02.07
G. Chevrolet	5:34.10	11:02.40
Lewis	5:39.50	11:17.12
Alley	5:43.97	11:30.65
Henderson	5:54.00	11:50.23
Mason	6:25.05	12:38.39
Trekus	8:25.05	15:05.58

50-MILE EVENT

	20 Miles	40 Miles	50 Miles
De Palma	11:25.58	22:35.63	28 09.38
G. Chevrolet	12:29.70	23:43.06	29:16.01
Lewis	11:28.05	22:44.16	28:24.65
Henderson	11:58.83	23:52.84	29:41.22
Alley	11:28.68	22:47.85	30:02.68

100-MILE EVENT

	20 Miles	60 Miles	100 Miles
Chevrolet, L.	11:37 93	34:14.10	56:29.50
Lewis	11:39.20	34:19.30	56:55.81
De Palma	11:37.34	.....	57:36 16
Henderson	11:38.33	36:07.66	59:43.72
Alley	11:40.12	1:04:15.21	1:30:35.37
Trekus	15:29.63	56:14.02	1:34:07.37

Wallis Tractor Has Novel Frame

(*Continued from page* 409)

The rear axles are 3 in. in diameter and are made of 40-point carbon steel, which is heat-treated. After heat-treatment the axles are ground to the exact size for the Hyatt bearings. The master gears are massive drop forgings, upon which the teeth are cut and which are then hardened and pressed onto the axles under hydraulic pressure. The mounting of the steering fork is somewhat different from that on the Cub.

This tractor has a wheelbase of 100 in.; a 30 by 8-in. front wheel, and 48 by 12-in. rear wheels. The wheels are of the flat-spoke type and the rear wheels are provided with angle-iron lugs. This tractor is rated to give a constant drawbar pull on the low speed of 2000 lb. and a maximum drawbar pull of 2600 lb. On the high speed it gives a constant drawbar pull of 1425 lb. and a maximum of 1850 lb. The low speed forward is about 2½ m.p.h., and the high speed 3½. The over-all dimensions are as follows: Length, 139 in.; height, 64 in.; width, 60 in. An oxy-acetylene welded fuel tank of 22 gal. capacity is fitted. The weight of the Cub Junior is 3000 lb.

Personals

T. H. Newberry, one of the directors and founders of the Packard Motor Car Co., Detroit, has been commissioned a lieutenant commander of the navy.

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B. H. Anibel, designing engineer of the Cadillac Motor Car Co., Detroit, has been promoted, and is assistant chief engineer.

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William K. Prudden. head of the Prudden Wheel Co., Lansing, Mich., expects to enter the Senatorial race from his district this fall.

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Charles F. Folkman has been elected vice-president of the Four Wheel Drive Auto Co., Clintonville, Wis., to fill the vacancy caused by the death of John Kalmes.

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Benton G. L. Dodge has succeeded James Braden as advertising manager of the Standard Parts Co., Cleveland. Mr. Dodge returns to his former position which he resigned to become sales promotion manager. Mr. Braden resigned because of ill health.

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R. T. Walsh, formerly advertising manager of Briscoe, has joined the Robert Smith Printing Co., Lansing, Mich., which handles the advertising of the Duplex Truck Co.

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Guy Gore, former advertising manager of the Redden Motor Truck Co., succeeds Walsh at the Briscoe plant.

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Nelson W. Hodge has resigned from the Aluminum Casting Co., Cleveland, and has become associated with the General Bronze Foundry Co., Cleveland, as manager of its two plants. W. E. Weaver, formerly manager, has been elected president of the General Bronze Foundry Co.

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C. W. Butterfield has been made sales manager of the Dyneto Electric Corp., Syracuse, N. Y., in place of H. D. Wilson. Other changes include the opening of a sales office in Detroit in the Garfield Bldg. with G. S. Monfort and C. H. Brennan as representatives. The Isolated Lighting plant business will be handled by C. L. Templar as sales manager and W. T. Schwarz, late of the Schwarz Advertising Studios, will have charge of the advertising. E. J. Murray, late of the Western Union Telegraph Co., S. S. Patrick, formerly eastern sales manager of the Beacon Falls Rubber Shoe Co., and C. E. Sherwood have been appointed district sales managers.

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F. H. Smith, assistant purchasing agent of the Maxwell Motor Co., has resigned to join the Wright-Martin Aeroplane Co., New Brunswick, N. J.

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C. E. Salisbury has been made service manager of the Hupp Motor Car Corp., Detroit, succeeding J. L. Kenyon, who has resigned to join the forces of the General Motors Corp. Mr. Salisbury has been assistant service manager in the past.

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Otto A. Lawton has been elected treasurer and director of the Bela Body Co., Amesbury, Mass. He is a director of the H. H. Franklin Mfg. Co., Syracuse. The Bela company, it is stated, has accepted an additional contract to build 1000 sedan bodies for the Franklin company. This order will require the erection of a new building of about 20,000 sq. ft. of floorspace.

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G. E. Strohm has been appointed division manager of the Prest-O-Lite Co.'s Detroit branch, succeeding T. A. Flaherty, who has joined the Officers' Training Camp, Fort Benjamin Harrison. Mr. Strohm will assume charge of the sales of all Prest-O-Lite products in the Detroit Division. E. W. Carpenter, for several years connected with the Baltimore branch of the Prest-O-Lite Co., Inc., has been appointed division manager with headquarters at Buffalo. In his new capacity Mr. Carpenter has charge of the sales development of Prest-O-Lite products in Buffalo and adjacent territory. He succeeds G. Abernathy, who has joined the Second Officers' Training Camp at Fort Niagara.

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Alonzo P. Ewing, vice-president of the Highland Park State Bank of Detroit, has resigned to assume an executive position with the Michigan Copper & Brass Co.

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W. J. Drumpelman, assistant sales manager of the Chalmers Motor Co., has resigned to become assistant general manager of the Elgin Motor Car Corp.

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George S. Morrow is again in active charge of the Saxon Motor Co., New York, eastern distributer for the Detroit company.

—

Guy Hutchinson has resigned as manager of the New York branch of the Willys-Overland Co. No successor to Mr. Hutchinson has as yet been named.

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Ralph F. Rice has been made a director and general manager of the A. Elliott Ranney Co., New York distributer of the Daniels. S. S. Toback resigned last week as president of the company.

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A. R. Goodman, formerly with the Scripps-Booth Motor Co., Detroit, has been appointed special district manager for the New England territory of the Olympian Motors Co., Pontiac, Mich.

—

D. F. Whittaker has become advertising manager of the Detroit Truck Co., Detroit. He was formerly assistant advertising manager of the Federal Motor Truck Co. H. E. Pierce, for nearly 10 years purchasing agent of the Regal Motor Car Co., will direct the purchases of the company.

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Wade V. Aydelotte, formerly staff man for the motor truck tire department, has been made manager of the Goodyear Tire & Rubber Co. branch at Newark, N. J. A. W. Ellis has been transferred from Louisville, Ky., to Long Island City, N. Y., as assistant branch manager. H. F. McClure, formerly general line salesman at Louisville, succeeds Mr. Ellis as branch manager there. H. T. Roseland, formerly manager of the Phoenix, Ariz., branch, has been appointed manager of the branch at El Paso, Tex., succeeding T. J. Fitzgerald, who has been called into the federal service. D. W. Sanford, general line salesman at Phoenix, becomes acting branch manager there.

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M. Freidman, formerly branch manager of the Prest-O-Lite Co., has gone to Buffalo, N. Y., to take charge of the branch there. James D. Reynard, who was with the Indianapolis headquarters, has taken his place.

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George C. Van Veen has been appointed manager of the new Chicago factory branch of the Mason Tire & Rubber Co. He was formerly manager of the Kansas City branch.

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ELECTIONS

CLEVELAND, Sept. 5—Geo. W. Booker, a St. Louis capitalist, has been elected president of the F. B. Stearns Co. Mr. Stearns retires because of ill health. W. F. McGuire, former production manager of the Ford company, is elected vice-president.

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KALAMAZOO, MICH., Sept. 1—C. H. Eaton has been elected president of the Kalamazoo Spring & Axle Co. F. V. Wicks is treasurer and J. S. Clary secretary. Mr. Clary was formerly with the Lee & Porter Axle Works, Buchanan, Mich. James L. Houghtaling has resigned from the company.

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Auto Parts Files Petition

CHICAGO, Sept. 1—Charging liabilities in excess of $200,000, creditors have filed an involuntary petition in bankruptcy against the Auto Parts Co. Frank McKay was appointed receiver. Charles Kramer, attorney for the creditors, said that the company's debts are probably nearer $300,000 than $200,000, and that assets are about $150,000.

The reorganization and the change in policy contributed to the filing of the petition. Attorney Charles Heffenberg represented the Auto Parts Co. at the hearing and agreed to the appointment of a receiver.

Factory

E. B. Hayes Axle Co., Oshkosh, Wis., is moving to Grand Rapids, Mich. The company, which is capitalized for $500,000, is erecting a factory at a cost of $100,000. The company, which now has over $800,000 of unfilled orders on its books, is connected by business relations with the Grand Rapids Malleable Iron Co., and, it is estimated, will employ 1750 men. The Hayes Axle Co. is the outgrowth of the Hayes Machinery Co. and manufactures 2½ and 3-ton truck axles. It is proposed to raise $350,000 by the sale of preferred stock.

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Saxon Motor Car Corp., Detroit, for the second time in 7 months has suffered damage by fire. A fire Aug. 30 destroyed thirty automobiles belonging to the company which were loaded at the Michigan Central loading dock.

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Fageol Motors Co., San Francisco, Cal., has completed the first unit of its new plant and will soon start manufacturing Fageol passenger cars, trucks and tractors. The plant is reported to be exceptionally complete in every detail and contains the newest manufacturing devices.

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Holt Mfg. Co., Peoria, Ill., has added to its holdings of land, and contemplates trebling the size of its factory to handle Government contracts aggregating $10,000,000. New machine shops, foundry, etc., will be required.

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Lawson Aircraft Corp., Green Bay, Wis., incorporated recently with $300,000 capital, has broken ground for the new plant. The company has been operating in leased quarters for about five months.

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Ericsson Manufacturing Co., Buffalo, N. Y., has just broken ground for an addition to its plant. The new building, which will start manufacturing in October, will enable the doubling of the plant's present productive capacity. This 100 per cent increase in manufacturing facilities has been necessitated by the demand for the Berling magneto, which is now the Ericsson company's main product. Plans for further extension over part of the 13½ acres still remaining on the Ericsson property are now under consideration.

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West Bend Aluminum Co., West Bend, Wis., has awarded contracts for new buildings and factory additions costing about $50,000. The main improvement will be an L-shaped factory, 70 by 190 ft., three stories high.

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Bay City Auto Body Co., Bay City, Mich., has received an order for twenty-five truck bodies per month from a Detroit company manufacturing trucks for the government.

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Racine Auto Tire Co., Racine, Wis., which purchased a large factory site several months ago and intended to erect a new tire and rubber plant costing about $200,000, has been able to make the advantageous purchase of the big plant formerly occupied by the Fish Bros. Wagon Co., Racine, which will provide sufficient floor space for the company's needs at present. The Fish plant consists of a number of four-story brick factory buildings, containing a total of 250,000 sq. ft. of floor space. The work of overhauling the buildings is now under way and within 90 days the Racine company will be located in the new quarters. The working force will be increased to 600 and the output will reach about 1000 casings and tubes in 24 hours.

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Mason Tire & Rubber Co., Kent, Ohio, will erect several new buildings next spring. A new warehouse is under way now and will be finished within the next 2 months. A new cement house is in course of construction and the new boiler room will be completed in a month. The vulcanizing room will be enlarged by the addition of a two-story building, 40 by 84 ft. A new mill room, 60 by 109 ft., is also in course of erection.

The restaurant for the employees is now completed and will be in full operation by Sept. 1. This is so built that it can be enlarged at any time to accommodate any increase in patronage. Plans are now being drawn for a new office building to be ready by Jan. 1.

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Continental Motors Corp., Detroit, is considering plans for the sale of parts of its products in Philadelphia, Chicago, Kansas City, Boston and Indianapolis by opening a number of parts stations in these cities. This plan would relieve distributors and dealers from the expense of carrying large stocks of parts for Continental engines.

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Boone Tire & Rubber Co., Sycamore, Ill., is making excellent progress in the erection of its new plant at Chippewa Falls. The company has awarded contracts for about $20,000 worth of tire manufacturing equipment, to be delivered in about 60 days. The equipment includes two 48-in. heater presses, 31 ft. high; one 7 by 7 ft. hydraulic press, with a capacity of 125 tires a day; one 42 by 42 in. two-opening bead press; one heel and sole press; twenty tire building stands and a Hunter dry kiln.

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Universal Motor Co., Oshkosh, Wis., manufacturing electric lighting units for various departments of the military service, is negotiating for large government contracts. To accommodate its increased business the capital stock has been increased from $25,000 to $50,000.

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Buick Motor Co., Flint, Mich., which employs more than 10,000 workers, has had 604 men called by the draft and has requested the district appeal board to exempt six of these, claiming that they were vitally necessary to the company. Exemptions were denied in all instances. The positions filled by the men for whom exemption was requested were assistant traffic manager, chemist, track dispatcher, rate clerk, chief cost clerk and stock chaser.

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Landover Truck Co., Chicago, is moving its machinery and equipment to Marinette, Wis., where the former Main Street Iron Works have been made available for the company's use. Local capital is assisting the company.

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Four Wheel Drive Auto Co., Clintonville, Wis., will erect a new assembly room and storage building 140 x 180 ft., making four large structures to be added during the present summer. The other three buildings are: Machine shop, 100 by 180 ft.; heat treating room, 40 by 60 ft., and paint shop and warehouse, 100 by 120 ft.

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Automatic Control Trailer Co., Columbus, Ohio, will add to its equipment for the manufacture of automobile and truck trailers.

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Steiner Mfg. Co., Plymouth, Wis., maker of stationary and portable gasoline engines, has changed its corporate style to Plymouth Motor Mfg. Co., and will enlarge its line of products. The Steiner company moved to Plymouth from Chilton, Wis., about two years ago. Plymouth capital now is so heavily invested that it was deemed expedient to change the name of the corporation.

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Meyer Burstein, Neenah, Wis., manufacturer of waste for use around machinery, has completed the erection of a new three-story fireproof waste manufacturing plant, 60 by 120 ft. in size. It will employ about 100 men and women.

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General Auto Parts Corp., Newark, N. J., has filed plans for the erection of a one-story molding shop.

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The Adrian Steel Casting Co., Adrian, Mich., has added an automobile parts and machine shop. E. J. Bowerfind is in charge.

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Rotary Tire & Rubber Co., Zanesville, Ohio, is planning the construction of a factory to cost about $500,000.

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Miami Trailer Co., Troy, Ohio, has commenced work on a two-story addition, 60 by 65 ft., of mill construction.

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Grand Rapids School Equipment Co., Grand Rapids, Mich., will begin operations next month on its recent government order for 6500 motor truck bodies. The first delivery is planned for December and 160 cars of oak, ash, southern

pine and gum lumber are now being assembled. When fully under way the company expects to turn out 1000 bodies a month.

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Safety Insulated Wire & Cable Co., Bayonne, N. J., has taken out a permit for a one-story extension to its plant.

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Elgin Tractor Co., Piqua, Ohio, is planning to erect a two-story concrete factory, 60 by 220 ft.

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Romeo Foundry Co., Port Huron, Mich., is building a $200,000 addition to its factory, which it will use for the manufacture of automobile castings.

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Convertible Tractor Corp., St. Paul, Minn., has moved into its new factory at 1485-1489 Marshall avenue. A good deal of machinery is already installed and tractor attachments are being shipped. A larger building will be added in the near future and when completed the new complete tractor will be put on the market. The Me-Go convertible tractor attachment now being produced sells for $250.

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PRODUCTION

BURLINGTON, WIS., Sept. 1—The Burlington Motor Truck Co., incorporated with $50,000 capital to manufacture commercial car units for application to Ford chasses, has decided upon a production of 600 units before Jan. 1, 1918. The company has established a sales office at 160 West Jackson Boulevard, Chicago. The outfit sells for $395 complete for attachment to the standard Ford chassis.

OSHKOSH, WIS., Sept. 1—The Challoner Co., for many years a large manufacturer of sawmill and woodworking equipment and other machinery, is preparing to devote most of its attention to the production of a new type of non-skid chain for motor trucks, to be marketed under the name of "Giant Grip." The company has disposed of its foundry equipment and will use this shop for the manufacture of the non-skid device. The die-room will be doubled in size and considerable new equipment installed.

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INDIANAPOLIS, IND., Sept. 1—The Champion Shock Absorber Sales Co. has placed upon the market a new Ford shock absorber. This new product is featured by twin coil compression springs of crucible steel, heavy malleable castings, grease cups and S. A. E. bolt equipment.

Calendar

ASSOCIATIONS

Oct. 9-11—Pittsburgh National Assn of Purchasing Agts., Convention.

Oct. 9-11. — Chicago, National Federation of Implement and Vehicle Dealers' Assn., 18th Annual Convention. Hotel Sherman.

CONTESTS

Sept. 1-2—Detroit, Mich., State Fair, Track Racing and Aviation.

Sept. 3—Uniontown, Pa., Speedway Race.

Sept. 3—Cincinnati, O., Speedway Race, Championship.

Sept. 6—Red Bank, N. J., Track Race.

Sept. 8—Hillclimb, Pike's Peak, for stripped stock chassis.

Sept. 15 — Providence, R. I., Speedway Race.

Sept. 22—Allentown, Pa., Track Race.

Sept. 22—New York Speedway Race.

Sept. 28—Trenton, N. J., Track Race.

Oct. 6—Danbury, Conn., Track Race.

Oct. 6—Uniontown, Pa., Speedway Race.

Oct. 13—Richmond, Va., Track Race.

Oct. 13 — Chicago Speedway Race.

Oct. 27—New York Speedway Race.

Oct. 24—Columbus, Ohio, Dixie Highway Tour.

SHOWS

Sept. 2-9—Spokane, Wash., Interstate Fair.

Sept. 3-7—Indianapolis, Indiana, State Fair, Indianapolis Auto Trade Assn.

Sept. 9-15 — Milwaukee Show, State Park Fair, West Allis.

Sept. 9-15 — Milwaukee, Wis., Fall Show, Wisconsin.

Sept. 17-24 — Grand Rapids, Show, Automobile Business Assn.
State Fair, West Allis, Milwaukee Automobile Dealers.

Sept. 18-21 — Toronto, Annual Tractor Show, Canadian National Exhibition.

Sept. 18-22—Los Angeles, Cal., Second Annual Tractor Demonstration, Tractor Engine and Implement Dealers' Assn. of Southern California.

Sept. 18-22—Reading, Pa., Automobile Show at Fair, Reading Automobile Dealers' Assn.

Oct. 1-6—Buffalo, N. Y., Closed Car Show, Automobile Dealers' Assn., Elmwood Music Hall.

Oct. 13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers' Assn., State Fair.

Nov. 12-18—Denver, Colo., Show, Auditorium, Automobile Trades Assn. of Colorado.

1918

Jan. 5-12—New York Show, Grand Central Palace, National Automobile Chamber of Commerce.

Jan. 19-26—New York, Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.

Jan. 19-26—Montreal, Show, National Motor Show of Eastern Canada, Montreal Automobile Trade Assn.

Jan. 26-Feb. 2—Chicago National Show, Coliseum and Armory, National Automobile Chamber of Commerce.

Engineering

American Railway Master Mechanics' Assn.
America nInstitute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automotive Engineers.
Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architecture and Marine Engineers.

SEPTEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. Section.

8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

10-14—Assn. Iron & Steel Elec. Engrs annual convention at Philadelphia.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

20—Mining & Met. Soc. of Amer. monthly meeting N. Y. section at Engrs. Club.

24—Amer. Inst. Metals at Boston.

24—Amer. Fdry. Assn. annual meeting at Boston.

OCTOBER

6—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

13—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

17-18-19—Amer. Gas. Inst. at Washington, D. C.

18—Mining & Met. Soc. Amer. monthly meeting New York section Engrs. Club.

20—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

NOVEMBER

3—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

10—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

15—Mining & Met. Soc. Amer. monthly meeting New York section at Engrs. Club.

15-16—Soc. Naval Arch. & Marine Engrs. annual meeting.

17—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

19—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

DECEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

20—Mining & Met. Soc. Amer. monthly meeting New York section at Engrs. Club.